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BRITISH APPRENTICESHIP

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IN THE re-casting of Britain's industrial economy recruitment of the ranks of skilled labor has necessarily received anxious attention. Ten years ago a nation-wide inquiry was conducted under the auspices of the Ministry of Labor into methods being used for training boys and girls for the skilled occupations. Apprenticeship systems on traditional lines were then found to have revived more widely than had been supposed. It was estimated from such data as were procurable that nearly one-seventh of the male work people under 21 years of age in industrial occupations in Great Britain were apprentices and that about one-fifth were either apprentices or were employed under some form of training adopted in substitution for, or as an alternative to, apprenticeship. The textile industry in which there are special methods of replenishing labor ranks was not included in this estimate.

Among the points emphasized by the investigation were these:

Apprenticeship or formal training of any sort was unrecognized by 70 per cent of the employers in the industries concerned.

The smaller firms contributed more apprentices in proportion to their size than the larger firms.

A tendency to make apprenticeship or learnership dependent upon word of mouth agreements instead of on indentures or other legal instruments had impaired the status of the contract as it had been understood in the past.

It was plain that if the youth of Britain was to infuse new life into the skilled occupations which the circumstances demanded, its training must be put on a different footing. The principles for which the old apprenticeship system stood must be adapted to the changed exigencies of industrial life. Britain was in the midst of a revolution brought to a climax by the intensified pursuit of mechanization and mass production. There had come into the engineering industry and related industries a new class or type of worker, the minders of automatic or semi-automatic machines. Their qualifications were often vague. They acquired skill in the particular job to which they

Apprentices at the Rugby Works of British Thomson-Houston Co., Ltd., are trained in metal turning in this bay of the apprentice shop

Photos by courtesy of British Thomson-Houston Co., Ltd.

were put, and by a process known as "up-grading" they were given opportunities of development.

But while there was a spontaneous growth of machine-minders, training of the mechanics who had to make the machine and see that it functioned efficiently demanded a great deal more thought than had been given to it. Since the report on apprenticeship was issued between seven and eight years ago, attention has been concentrated on the evolution of systems of training which will give Britain a new race of mechanical engineers. The problem is in the transitional stage.

Industrial revival in the United Kingdom has forced the adoption of systematic measures to train the machinists, engineers and executives needed by the metal-working industries

In some districts, particularly in the English Midlands, the training of youth for engineering in its many diversifications has been given a broader basis by cooperation between the local educational authorities, the organized employers and the trade unions. Care has been taken in providing opportunities for advancement by merit not to fix the general qualifications too high. The object has been to insure that any youth of average intelligence may take the composite courses of academic and practical education and win a diploma of proficiency at the end. Normally the course divided between training college and work shop lasts three years. Having got his diploma the youth passes into the class of improvers. From this class the employer expects to recruit his key men. The trade union claims that it should have some say in regard to the pay and conditions applying to the period of training but this has not been conceded up to now. The point is not so strongly contested, however, as to impair the friendly cooperation of all the parties. It is conceded that in the years this scheme has been on trial it has proved itself worthy of wider application.

Wages Increased

The period of apprenticeship and the rates of wages vary widely. Often boys taken from school at 14 are required to serve a term of seven years. But the tendency in the newer branches of engineering—automobile, aircraft, electrical, etc.—is to start later, generally at 16 or 17. Though there are many exceptions, the rule is to finish the training at 21. In the inquiry previously referred to it was found that the wages paid in the first year varied from 3/ to 27/ per week, but that the usual range in engineering was from 8/ to 12/. The remuneration increased until, in the last year, an average 20/ and 32/ was paid to young engineers. An agreement between the employers association and engineering union in the Midlands provides that young journeymen on completing their apprenticeship, having served at least five years in the trade, shall be paid 10/ below the full district rate, advancing by progressive increments to full rate, at the age of 22½ years. There are no agreements of general application relating to apprenticeship and improvership in the engineering industry.

It is in the newer branches that the trend of present day developments may best be studied. There the inadequacy of the old forms of recruitment and training is most apparent. There too, the pressure of expanding trade makes the need of reinforcing the supply of skilled labor with special qualifications for adjustment to a rapidly changing manufacturing technique most urgent. A number of big industrial corporations have been forced by sheer necessity to take quick decisions and act upon them as the only alternative to being left behind in the race.

Not only the United Kingdom but the world is being scoured for likely recruits. The enlistment of young men from the British Empire overseas, as well as from foreign countries, has in view, though not necessarily as a primary consideration, the expansion of the export trade. Many firms regard this means of access with disfavor, however, and some expressly exclude it from their scheme. Quite commonly training courses for full apprentices begin at 16 years of age, when boys are set free from secondary schools. Boys who are taken on at the works from elementary schools are regarded as probationers and spend their time making themselves useful about the shops until they obtain the age of 16.

A good illustration of the specialized forms which training is taking is provided by the scheme of the Austin Motor Company, which operates the biggest single manufacturing unit in the automobile industry in Britain. Roughly the firm requires a stream of recruits in the ratio of one to ten of its personnel. Its recruitment is conducted on lines corresponding to the special exigencies of the firm. Organically it is distinct from any other scheme. In its general features, however, it is typical of a number of experiments in the newer engineering branches.

Engineering Apprentices

Engineering apprentices who are a great majority of the training department are drawn from certified students in high-grade schools. Their physical fitness must be vouched for by a doctor. Athletic capabilities count where academic qualifications are equal. There are three occasions during the year when apprentices may enter—January, May and September. The age of entry varies from 17 to 17½ years. The term of service is 4 to 5 years, including a six months probation which counts in the indentured term if the candidate is finally admitted. Wages during the first year are 7/6 per week; second year, 10/, third year, 12/6, fourth year, 15/ plus the progressive bonus starting at 2/6, and other bonuses based on output, diligence in school studies and meritorious service in other respects. For eight months the apprentices are usually engaged on simple machine operations as preliminary works experience. Then they gain an insight into foundry practice or alternatively simple office routine.

After the first year their work is shaped toward ultimate specialization in some branch of engineering. The bias is not finally determined, however. Students are encouraged to discuss their problems with the teachers as the best means of educing their natural aptitudes. Technical training at a publicly provided college proceeds side by side with the practical training at the works. The college and works are separated by five miles. The minimum attendance is one day and one evening per week.

Youths on the technical side put in one whole day and two evenings per week. Class fees are paid in the proportion of two-thirds by the firm and one-third by the apprentices, who receive wages for attendance. The national standard of proficiency and application is laid down as a criterion for qualification.

A supervisor appointed by the firm is the executive chief of an organization which has the oversight of the apprentices during their period of service. Recruitment being world-wide, the apprentices are a cosmopolitan community in which China, India, South Africa, the Argentine, Canada, Germany, Norway, Spain and other countries are represented. Only about 40 per cent of the students are within living distances of their homes; the rest are taken under the wing of the supervisor who sees that they have suitable lodgings and maintains personal contact with them in their social life and recreations as well as in matters more immediately concerned with their career. This is one of the distinguishing features in the Austin scheme. Self-government has a prominent place in the student's organization which has been created. Certain boys are chosen from time to time as prefects and placed in charge of their fellows engaged in different parts of the works, and sports and social activities are under the control of an apprentices' committee and one supervisor.

Apprentices are encouraged to seek experience under other employers on completing their period of training. In many cases, however, the connection is renewed after this object has been achieved, and a number of responsible posts in the Austin works are filled by men who served their apprenticeship there. An arrangement for the exchange of ex-apprentices with another firm allied with the automobile trade provides other means of broadening the qualifications and outlook of young men on the threshold of their careers. An association of apprentices from many leading engineering firms in the English Midlands has organized a tour of Germany for this summer, which it is hoped may result in useful contact with young German engineers.

The wages paid to apprentices in the automobile industry of Britain range from 10/ to 20/ per week at the age of 17, and 24/ to 40/ at 20, according to the rates laid down by individual firms. Statistics are lacking on which to form more than a vague idea of what becomes of the apprentices in after life. A representative firm which made endeavors to trace those who had been trained at their works—the automobile trade including design, production, administration and selling—found that a large proportion became efficiency and planning experts, a still larger proportion found employment on the sales side, a good number secured positions as works managers, some went in for experiment and research, while others used their technical knowledge in the commercial department. Sales and service claimed most of those who went abroad, but the great variety of occupations to which ex-apprentices turned their talents in foreign countries bore striking testimony to the breadth of their attainments. It is axiomatic in Britain that the more comprehensive the student's training, the more favorable his prospects in later life. The unions lay stress on the importance of an all-round training for mechanics. They attribute previous deficiencies in the skilled man power available for the machine tool trade and other key occupations to neglect of the old thoroughness in the upbringing of learners.

In the sheet metal training shop of BTH at Rugby apprentices learn how to make paint cans, as shown, and other kinds of containers

For Supervisory Positions

At the works in Birmingham equipped for production of Cincinnati milling machines, a scheme has been set going of systematically training boys for supervisory positions. A British foundry school started last year takes young men who have had practical works experience and gives them a twelve months course of whole time instructions directed to fitting them for the highest technical and administrative position.

Three of the leading firms in the electrical industry have schemes of training in operation which, though they are not identical, follow much the same general lines—the General Electric Company, the Metropolitan-Vickers Electrical Company and the British Thomson-Houston Company. The last-named has an apprentice training room as part of its headquarters organization at Rugby where machine tools, benches and other equipment are installed. There under the guidance of skilled craftsmen the young apprentice is initiated into machining, fitting, sheet-metal-working and welding.

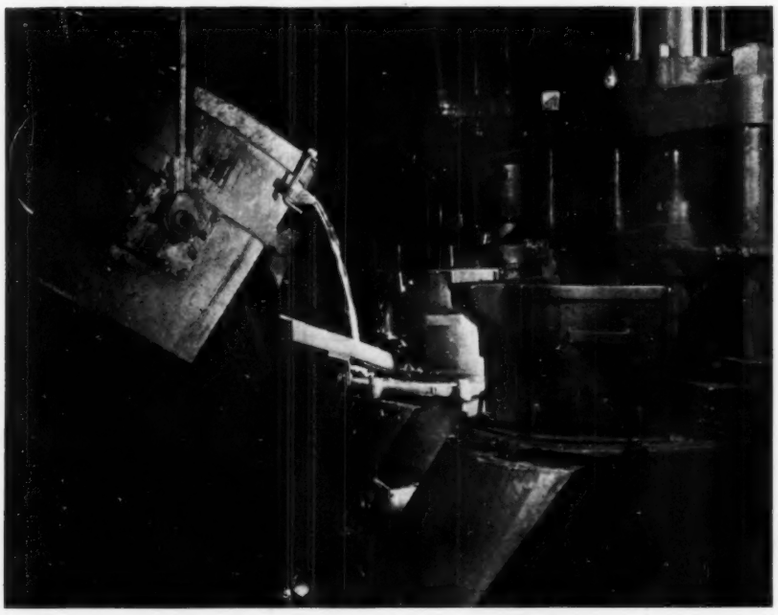
This firms lays stress upon personality and character in sifting the suitable of youths who seek admission. The system of training is given wide scope to embrace diversity of attainment in the school or college education and to lead in sequence to the various departments that have to be recruited.

Late Trains and Machine Equipment

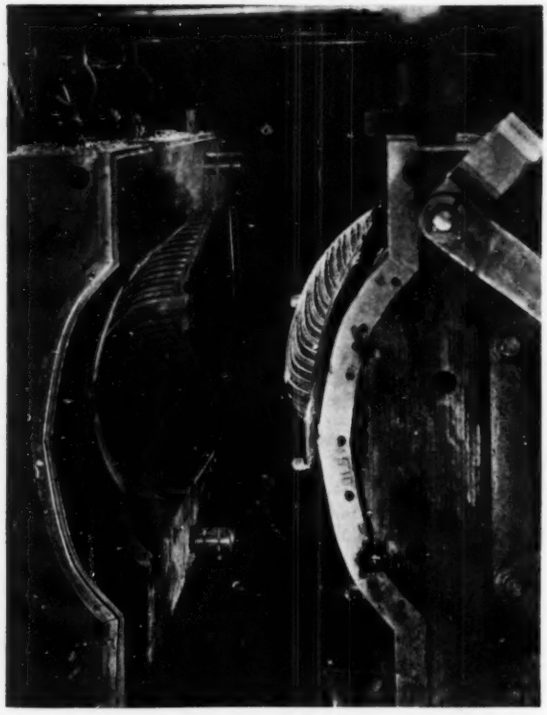
Maintenance of motive power depends on both management and machine equipment. When a nationally advertised train is delayed on two divisions by locomotives that will not make steam, either or both the aforementioned "m's" must be blamed. When supposedly crack trains lose an hour and a half on an overnight run, other methods of transportation get a boost at the expense of the railroads. Trains late because of antiquated equipment reflect expensive ideas of economy.

DIE CAST

Ternstedt's production of large run and small run die castings for automotive use affords a good chance to compare methods



Zinc alloy is not melted in the machines but is delivered to them by ladle in the molten state



An offset strip at the edge of the die prevents metal spatter in case the die fails to lock completely in the closed position

HERBERT CHASE

ALTHOUGH many persons are well aware of the importance of zinc alloy die castings in modern automobile production, there are probably few not directly concerned who appreciate what is involved in the production of these castings or the volume in which they are manufactured. The largest shop devoted exclusively to the production of automotive die castings happens to be one about which little has been written. It occupies a portion of one of the plants constituting the Ternstedt Manufacturing Division of the General Motors Corporation in Detroit, and is given over almost entirely to the production of die-cast hardware and related parts for the Fisher Body Division of the same corporation.

Some idea as to the extent of this operation may be gained when it is stated that, in recent months, the shop in question has been casting about 230,000 lb. of zinc alloy per day. It produces a total of some 600 different parts and is one of few plants, and the only one of comparable size, which finishes completely all the die castings it produces, or all that require an applied finish. In some months it turns out no less than 8,000,000 finished die-cast parts, and these range in size from die-cast grilles weighing 18 to 20 lb. each and hood moldings some 62 in. in length to small hardware parts weighing a fraction of an ounce. A goodly proportion of these parts are not only cleaned and polished but are given an enduring plated finish; some of them receive, in addition, a decorative finish of synthetic enamel over part of their area.

As might be expected, the casting shop occupies only a small proportion of the total space required for turning out the finished die castings, but it is well arranged for rapid production and handling of castings, and has good facilities for melting and delivering metal to the casting machines as well as for returning gates, sprues and flash to the furnaces for remelting.

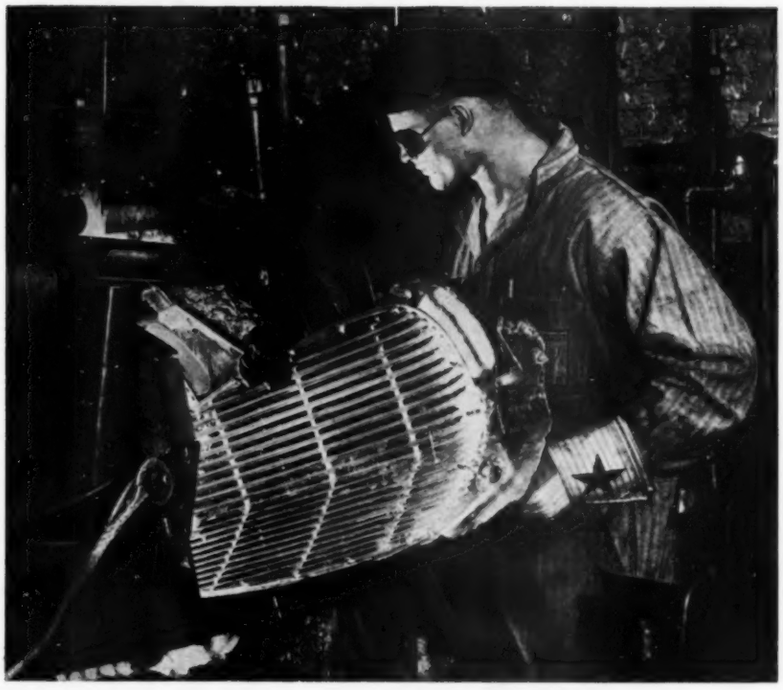
Defective Castings Returned for Remelting

There are 50 die-casting machines, most of them arranged in double rows with metal pots toward the aisles. Between the two sections of each row and parallel to the aisles are belt conveyors arranged to carry castings from the machines to inspectors at the ends of the row. As castings are ejected from the machines, the operators first plunge them into water and then place them on the conveyor belt. When the castings reach the inspectors, they are removed, inspected and gates and sprues are broken off. The latter are dropped onto a second conveyor belt which carries them back to the melting furnaces; defective castings are similarly handled. If the latter recur,

the machine operator involved is quickly informed so that the required adjustment or remedy may be applied before any considerable number of defective castings is made. On the other hand, the operator is relieved of inspecting duties and can devote his entire time to production. Perfect castings are dropped into tote boxes and delivered to the cleaning department.

A few of the largest machines are placed in a separate row but, like the others, have the metal pots toward the aisle. The other end of these machines is toward a wall which separates the casting room from the cleaning department. Two of the large machines are in constant use producing grilles for the Olds six and all Buick models, and others are used for other large parts, including long moldings, not suited for handling on a belt conveyor. Grille castings taken from the machines are first placed on a bench parallel to the machine and then are slid down a short inclined roller conveyor into a tank of water from which they are removed on the other side of the wall in the cleaning department.

Grilles are now being produced at the rate of about 60 to 65 an hour per machine. It is necessary for a casting of this size to cool considerably in the die before it can be removed and handled without distortion. Metal is forced into the die by an air-operated plunger, of course, the size of air cylinder and plunger and the air pressure being such that the pressure on the metal is about 1600 lb. per sq. in. The machines are hydraulically operated with toggles for locking the dies, and are of Ternstedt design.



When the die opens the operator removes the cast grille and plunges it into a tank of water

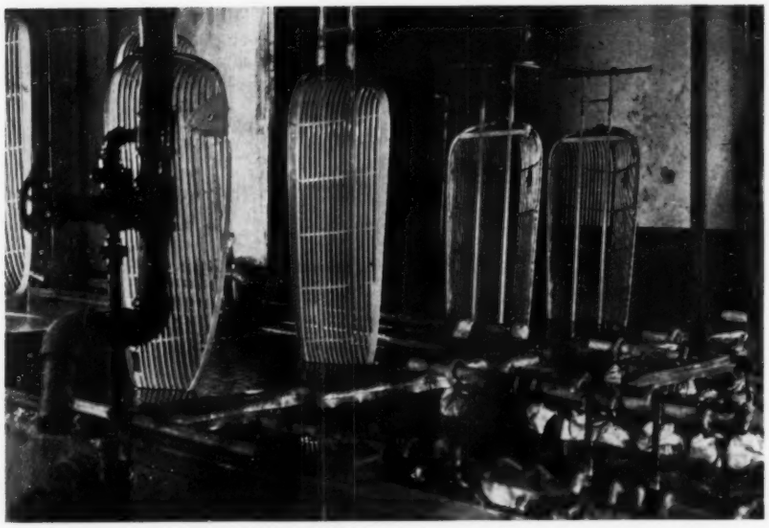
After casting flash is removed by the use of trimming die in a large press

Multicavity Dies for Small Parts

Many of the smaller machines, which are often used with multiple-cavity dies, are either fully automatic or semi-automatic and can be made to yield up to 400 or more casts an hour. All machines are gas-fired and are arranged to maintain substantially constant metal temperatures of 780 to 800 F. Metal is fed into the dies at 1600 to 2400 lb. per sq. in. Nineteen of the machines used are of the type designed and used also by the A. C. Spark Plug Company and have the front half of the die arranged to move with the metal pot when the die is opened.

Instead of delivering ingots direct to machines for melting in their respective metal pots, all melting is done in two large furnaces arranged adjacent to the casting machines, and the metal is delivered to the latter in molten form. It is drawn from the melting furnaces into insulated tilting crucibles suspended from monorail trolleys and is carried by the latter over the aisles to the respective machines. This not only helps to maintain a substantially constant temperature in the metal pots, but relieves the machine operators from having to feed metal into the pots.

Nearly all castings are made from what is commonly called the No. 2 alloy, corresponding to S. A. E. No. 921 and A. S. T. M. No. 21, which is made from high-purity zinc and contains 2.5 to 3.5 per cent of copper, 3.5 to 4.5 per cent of aluminum and 0.02 to 0.10 per cent of magnesium. This



Cleaning and plating is automatic with grilles lifted and lowered into the successive baths by means of a carefully timed conveyor

is the hardest and has the highest tensile strength of any of the zinc die-casting alloys in common use and is one of the most widely used. With proper die design and good casting practice, it yields castings with smooth surfaces which require a minimum of polishing to prepare for plating.

Flash Removed by Machine

Cleaning of flash from castings is done by machine so far as practical, but hand filing or grinding is required on some castings. Grilles have the flash trimmed in a die fitted in a large punch press, but considerable hand finishing is required to remove burrs. As with many die castings produced in this shop, although both types of grille (Olds and Buick) undergo considerable automatic polishing prior to plating, hand polishing on conventional wheels is required. Space does not permit of a detailed description of polishing operations, but it may be said that there is a special type of machine for polishing the greater part of each grille. Olds grilles are polished at the rate of 68 an hour on one type of automatic machine, the grilles being carried under the wheels in successive steps with automatic means for tilting the grille after one half has been polished. The wheels are carried at the end of a hinged arm, the whole carrier and its driving motor making three strokes each way on each side of the center line to finish each half. There is, of course, a separate fixture for each grille, of which there are five in the machine at one time, but the wheel polishes only one at a time, hence loading and unloading can be done while polishing is in progress.

For the Buick grille, a different form of machine which handles only one grille at a time is used, but this grille is polished all over at one pass each way under the polishing wheels. Several parts, including many door handles and other hardware items, are also polished and buffed on automatic machines. In some of these, the fixture is carried forward on a chain, passing successively under several wheels which polish and buff two or more surfaces, the fixture being flipped over automatically, in some cases, to bring a new surface under the wheels. In these machines, the operator need do very little except load and unload. In some other semi-automatic polishing, two wheels are so placed that both polish different surfaces at the same time as the piece is pivoted or moved appropriately by the fixture. In many cases, however, some part of each piece of hardware requires some hand polishing to reach surfaces which the automatic polisher does not touch.

Handling While Plating

Small castings are handled largely in tote boxes, but the grilles, after leaving the initial cleaning department are hung on an overhead chain conveyor which carries them to points where all subsequent operations are performed. Small parts are usually wired together for plating and carried through automatic plating tanks, which include, of course, the necessary solutions for cleaning and rinsing on automatic machines which are timed to give the required dwell in each tank. The same may be said of the grilles, except that they are handled individually and in a separate machine which, besides initial cleaning and intermediate rinsing, gives a 12-min. plate in copper followed by 35 to 40 min. in the nickel plating bath, or sufficient to apply about 0.0004 in. of copper and 0.0006 in. of nickel, as required in the specifications General Motors has adopted for plated die castings for outside use.

Combination Finishes

Following the nickel plating, the grilles are buffed (or colored) and after cleaning are given their final thin flash of chromium. After careful inspection, those which require enamel on certain recessed surfaces for contrast and decoration are delivered to a painting department where they are passed to a spray booth, one at a time, and are given a coat of synthetic enamel all over. The plated face is then cleaned off, using a strip of wood covered with clean cloth so that the enamel in the recesses will not be disturbed. This is done by girls, with the grille lying face up on a bench, and it requires two successive wiping operations and some touch-up work with a brush and small spray gun.

When the enamel is removed from the surfaces which are to remain bright, and all recesses are filled, the grilles are hung again on a conveyor which carries them through a drying oven to dry and harden the enamel. After issuing from this oven, the grilles are inspected and then are packed in cases with padded separating racks for shipment to the Olds assembly plant. Buick grilles, which require no enameling, are shipped, of course, without passing to the enameling department.

Special Machine for Chromium

Many of the small hardware parts which have been nickel plated and buffed ready for chromium plating are handled in a chrome-plating machine designed especially for use in the Ternstedt plant. This machine is equipped with special carriers mounted on a chain and designed to hold the part while the latter is dipped into and carried through the plating solution, and then through a rinse. This is a continuous operation and the operator need only load and unload the castings at the proper stations.

WHICH FILE SHALL WE USE?

Standard tests show a big difference in the metal-removing efficiency of files, and serve as a basis for selection in view of the current labor rate

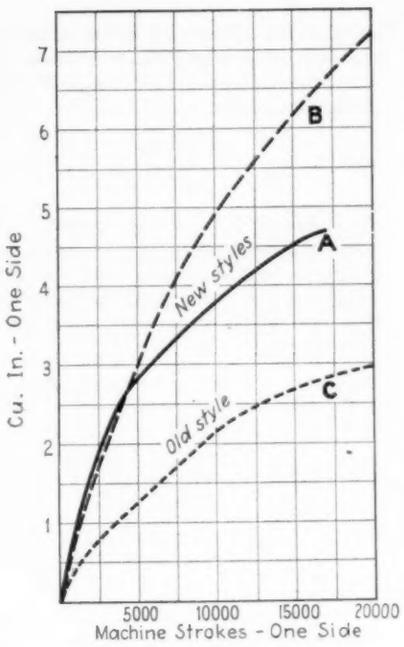


Fig. 1—Cubic inches of material removed vary with the design of the file and the number of strokes of the test

C. D. GILPIN

IT HAS been said that every dollar spent in the purchase of files implies that from $4 to $50 will be added to the factory payroll. Thus it follows that maximum economy of the filing operation becomes of real importance. This economy is dependent both on the selection of the most suitable file, and the manner in which the file is used in service.

As an approach to the problem, such styles of files as can be handled on a standard "Duplex" testing machine were chosen for examination. Of these the 14-in. double-cut flat bastard file is assumed to be representative. Stroke of the testing machine was 6 in.; speed, 60 surface ft. per min., and the pressure, 35 lb. per sq.in. Test bar measured 1x1 in., the composition being 0.60 carbon and 0.70 manganese and the hardness from 228-255 Brinell.

In Fig. 1 each of the curves illustrates the one-side average performance of a considerable number of samples. Files *A* and *B* represent two different tendencies of modern design, which might be contrasted as "high original speed and short life" versus "moderate early speed and long life." File *C* has been included largely for the sake of illustrating the progress made by many file manufacturers in the last few years.

The file user prospers most when the sum of the purchase price and labor expense is at a minimum. The duration of a standard test should, therefore, duplicate as nearly as possible the life of a file that is used to the best commercial advantage. Interpretation of the result must be qualified both by the purchase price and the prevailing labor rate.

As a first step it is essential to translate the machine results of Fig. 1 into terms of human labor. Although the machine pressure of 35 lb. is not high, it exceeds the average pressure exerted by a considerable number of workmen. The 6-in. stroke, and the speed of 60 strokes per min. are both close to average practice, but it is inconceivable that the ordinary worker will average such an output. My estimate is that the mechanic will have an output of about one-third that of the testing machine. In other words, 1,200 strokes of the latter should be equivalent to one hour of work. Since the record chart is ruled in 1,250 stroke divisions, 1,250 strokes has been chosen as the "conversion factor."

In the preliminary investigation of files *A*, *B* and *C* of Fig. 1, assume conditions that give the "long life" feature extreme importance. This will establish the maximum useful length of test in determining the real commercial efficiency. Such conditions are attained when the purchase price is quite high and the labor rate very low.

The price of a 14-in. double-cut flat bastard file is likely to vary between 40 cents and 60 cents, depending on the quantity purchased. Assume that *A*, *B* and *C* cost 60 cents. The data of Fig. 1 apply to a fraction only of

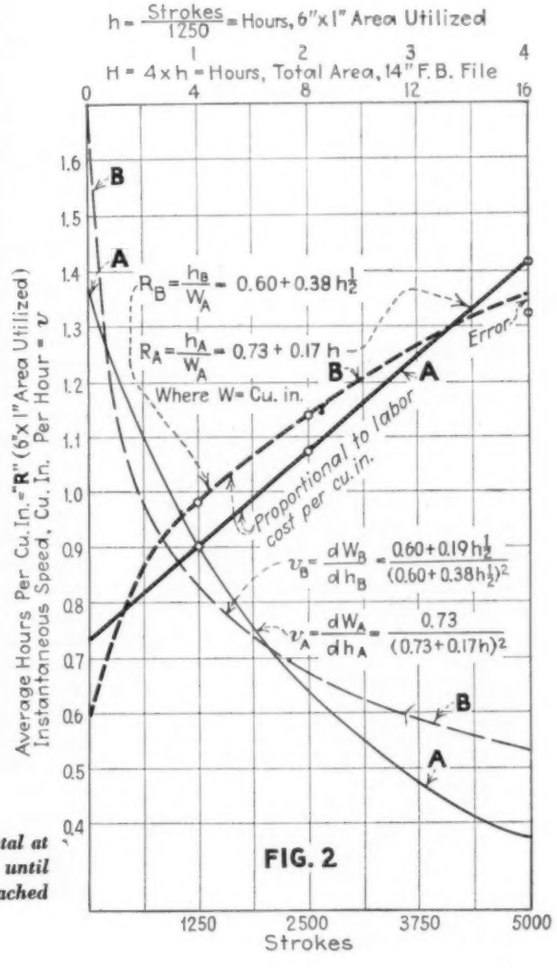

h = Strokes/1250 = Hours, 6"x1" Area Utilized
H = 4xh = Hours, Total Area, 14" F.B. File
Average Hours Per Cu.In. "R" (6"x1" Area Utilized)
Instantaneous Speed, Cu. In. Per Hour = v
R_B = h_B/W_A = 0.60+0.38 h_B^1/2
R_A = h_A/W_A = 0.73 + 0.17 h
Where W = Cu. in.
Error
Proportional to labor cost per cu. in.
v_B = dW_B/dh_B = (0.60+0.19 h_B^1/2)/(0.60+0.38 h_B^1/2)^2
v_A = dW_A/dh_A = 0.73/(0.73+0.17h)^2
A
B
Strokes
1250
2500
3750
5000

FIG. 2

Fig. 2—File A *removes metal at a faster rate than file* B *until the 4,000 stroke point is reached*

one of the two file sides; in the case of the 14-in. size, about one-quarter of the total useful tooth area is affected. Thus, if W be any number of cubic inches as shown on Fig. 1, P the purchase price and a the area factor, the filing expense per cubic inch chargeable to file cost will be aP/W; or under the conditions just assumed $\$0.15/W$.

For a minimum probable labor rate, 40 cents per hr. has been assumed. If s be the number of machine strokes corresponding to W; h the equivalent labor hours, and L the labor rate per hour, the labor expense per cubic inch will take the general form of Lh/W, or $Ls/1250W$; or under the conditions assumed, $\$0.40s/1250W$.

Filing cost for three types of 14 in. files. Purchase price, 60 cents Labor, 40 cents per hour

File A		*File B*	*File C*
1250 strokes (1.11 cu.ins.)		1250 strokes (1.02 cu.ins.)	1250 strokes (0.48 cu.ins.)
Labor	$0.360	$0.392	$0.833
File	0.135	0.147	0.312
Total	0.495	0.539	1.145
2500 strokes (1.86 cu.ins.)		2500 strokes (1.76 cu.ins.)	2500 strokes (0.80 cu.ins.)
Labor	$0.430	$0.455	$1.000
File	0.081	0.085	0.187
Total	0.511	0.540	1.187
5000 strokes (2.84 cu.ins.)		5000 strokes (3.03 cu.ins.)	5000 strokes (1.29 cu.ins.)
Labor	$0.563	$0.528	$1.240
File	0.053	0.050	0.116
Total	0.616	0.578	1.356
10,000 strokes (3.80 cu.ins.)		10,000 strokes (4.95 cu.ins.)	10,000 strokes (2.19 cu.ins.)
Labor	$0.843	$0.846	$1.461
File	0.039	0.030	0.068
Total	0.881	0.676	1.529

Throughout the life cycles of A, B and C, the table shows the two foregoing expense components, as well as their sums. The latter, of course, constitute the total filing costs per cubic inch at the various points under consideration. An inspection of these results makes it evident that the ordinary file test (10,000 strokes has been the usual minimum in the past) is entirely misleading, since the best economic life (minimum cost per cubic inch) is attained very early, even with high-priced files and a low labor rate. The following conclusions are evident:

1. File C is so wasteful of labor that it cannot be used economically even if its cost is zero.
2. File B, in spite of its long life, is noticeably inferior to A, if they are both priced alike, and if they are both discarded at somewhere near their best points of efficiency.
3. An increase in labor rate in relation to file price would increase the superiority of A and would shorten the best economic life for all files. The same results would be attained if the assumed conversion rate of 1,250 is too high.
4. If the conversion rate is too low, the effect will be the same as a reduction in the labor rate; that is, the best economic life for all files will be increased. An error would have to be very large to prolong the best life beyond 5,000 strokes.

These conclusions enable us to discard all data for A and B in excess of 5,000 strokes. If the performances of A and B up to this figure may be approximated by simple mathematical equations, it will be possible to investigate the change in best life with variations in price, labor rate and file characteristics.

The best method of analyzing the performance of a hand tool is to plot "average performance per hour" (which is directly proportional to labor cost) against "total hours." This relation can be expressed with considerable accuracy by the equation:

$$R = \frac{\text{hours}}{\text{cu.ins.}} = \left(\frac{h}{W}\right) = m + nh^c$$

where m, n and c are constants depending on the nature of the load and design of the tool, and where h represents hours.

On Fig. 2, the ascending curves for A and B have been plotted from the calculated equations for values between 0 and 4 hours, or 5,000 strokes. Since these curves are directly proportional to labor cost per cubic inch, they illustrate the early advantage of A, which is lost if both files are worked beyond 4,000 strokes.

The descending curves on Fig. 2, representing "speed of cutting at any instant," have been calculated from the basic performance equations. These curves illustrate that there may be a much more rapid deterioration in early life than would be suspected by casual inspection of the usual test chart.

Comparative Merits of Files

The principal object of the development of Fig. 2 has been to emphasize the fact that the two classes of design represented by A and B have very different characteristics. Therefore, if a standard test can be devised to reflect their comparative merits when each is used to the best commercial advantage, the solution will have a general application.

The next step is to utilize the performance equations of Fig. 2 to develop expressions for the most efficient commercial life; but it must be remembered that unless otherwise stated this life, whether expressed in hours of labor or in strokes of the testing machine, applies only to the area utilized by the latter. In the same manner, this area factor a will be used to modify purchase price P, so that throughout the performance and price of a definite area of file teeth will be dealt with. When the actual hours of shop service come into the picture, size must be considered.

If y is total filing cost per cubic inch, b the conversion factor between machine strokes and hours of labor, L the labor rate per hour, and W the cu.in. removed:

$$y = \frac{aP + bSL}{W} \qquad (1)$$

By differentiating y with respect to S and equating to zero, the following expressions for the life at which cost per cubic inch is a minimum are secured. The best life in strokes for the respective files is:

$$\text{For File } A = \frac{1}{b}\left(\frac{m}{n} \times \frac{aP}{L}\right)^{1/3} \qquad (2)$$

$$\text{For File } B = \frac{1}{b}\left(\frac{m}{n} \times \frac{aP}{L}\right)^{2/3} + \frac{2}{3}\frac{1}{b}\frac{AP}{L} \qquad (2)$$

The constants m and n, as well as the exponents, depend on the design of the file teeth, while a, P and L are related to shop conditions. From these equations the following general conclusions may be drawn as to the best economic life of a file:

1. The file constant m represents the reciprocal of initial speed; therefore best life tends to decrease with high initial speed. This does not mean that cost per cubic inch is unfavorably affected by high initial speed.
2. The file constant n represents the rate of increase of labor cost; therefore the less this rate of increase (or the better speed holds up) the longer will be the best life.
3. A mistake in conversion factor b directly affects the calculation for best life (or the slower the workmen, the longer the file may be used advantageously).
4. Best life does not depend directly either on the price of the file or the labor rate, but on the ratio between these two.

In Fig. 3, the horizontal divisions at the base express the "Labor Rate/Price" ratio as a single variable, allowance being made for the 0.25 area factor applied to a 14-in. file. Thus, the reader can make a quick calculation based on his own conditions, and

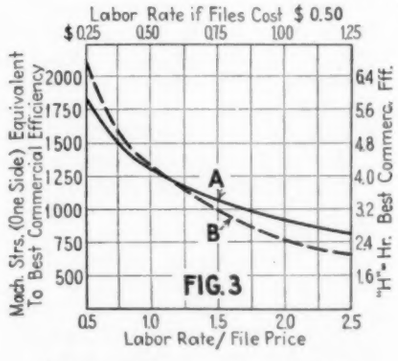


Fig. 3—With a given "labor rate/file price" ratio, the ideal length of test for either type of file design can be determined

can then determine from the notation of ordinates at the left, the number of machine strokes which would represent the ideal length of test for either of the two types of file design.

The figures at the top and the right hand of the chart have been added to make the illustration still more concrete. For instance, a 14-in. file costing 50 cents and identical with *B*, if labor costs 75 cents per hr., should theoretically be given a machine test of about 1,000 strokes. With the conversion factor *b* equaling 1250 this corresponds to 0.8 hr. of manual labor

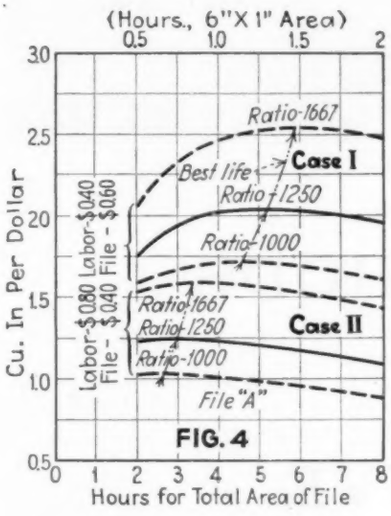


Fig. 4—For two conditions of file costs and labor costs, this chart shows the change in cubic inches filed per dollar of total expense

expended on the area tested, but since about four times this area is available in a 14-in. file, the ideal shop life for file *B* would be 3.2 hr. if used to cut material similar to standard test bar.

From the general equations for best life, and their graphic representation on Fig. 3, two distinct problems arise. The first is the development of a test which will reflect with reasonable accuracy the comparative merits of various files, when the latter are used to points approximating their best commercial efficiencies. The second problem is concerned with proper use in the shop. Its solution will be easy or difficult, depending on the nature of the filing operations which are being conducted.

Case 1 of Fig. 4 illustrates, for a file having the characteristics of Sample *A*, the change in cubic inches filed per dollar of total expense as life progresses, for a high-priced file and low-priced labor. Case 2 indicates similar relations for a low-priced file and expensive labor.

Now, the accuracy of the computations depends on the correctness of the conversion factor. The heavy curve for each case in Fig. 4 has been derived from a factor of 1,250; the light curves above and below illustrate the changes that would occur if a factor 25 per cent higher or 20 per cent lower had been used. Dotted oblique lines serve to connect the points of calculated highest efficiency for the three curves.

All three curves for Case 1 are reasonably flat between four hours and seven hours of shop service. In the same manner, the efficiencies for Case 2 do not change materially between the two-hour and five-hour points. Assume four hours of actual service as a mean value. This corresponds to one hour of work for the strip tested, or 1,250 strokes of the testing machine.

Conversion Factor Error

The next step is to assume that a 1,250-stroke test has been made with the purpose of calculating the commercial efficiency of file *A*, for comparison with some other sample. What error might be expected due to the selection of a test life that does not exactly correspond to the ideal life? An error in the conversion factor is serious or not, depending on whether it is sufficient to cause an important relative difference between efficiency at the proposed standard test, and the life at which the file gives the actual best performance. The maximum discrepancy will be if, for Case 1, the true conversion factor is 1,667 instead of 1,250.

If Fig. 4 is analyzed it will be found that the efficiency at the ideal life of between five and six shop hours is about 3 per cent greater than the efficiency at four hours. A test of 1,250 strokes will therefore give an accurate picture of file *A*'s possibilities in comparison to a competing make. If the price and speed characteristics of the latter were in line with *A*, the comparison error would be neutralized.

The next step is to complicate matters by assigning a price of 60 cents to file *A* and 40 cents to file *B* and to assume two sets of competing tests; one to be of the exact calculated number of machine strokes corresponding to the respective maximum commercial efficiencies, the other to consist of the proposed standard of 1,250 strokes. On Fig. 5, the heavy horizontal 100

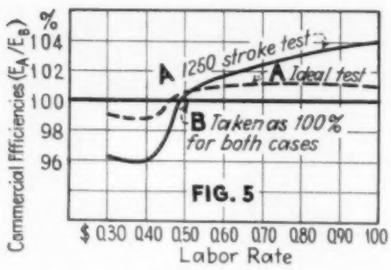


Fig. 5—When prices of Files A and B differ, the labor costs will influence the choice

per cent line represents in both cases the results obtained from file *B;* the light curve shows the relative efficiency of *A*, as based on a comparison of ideal tests, while the heavy curve represents a similar ratio as calculated from the 1,250 stroke tests. At the point where labor costs 46 cents per hour, the two files priced at 60 cents and 40 cents would actually be able to cut steel at the same rate per cubic inch, if they were both used to the best advantage.

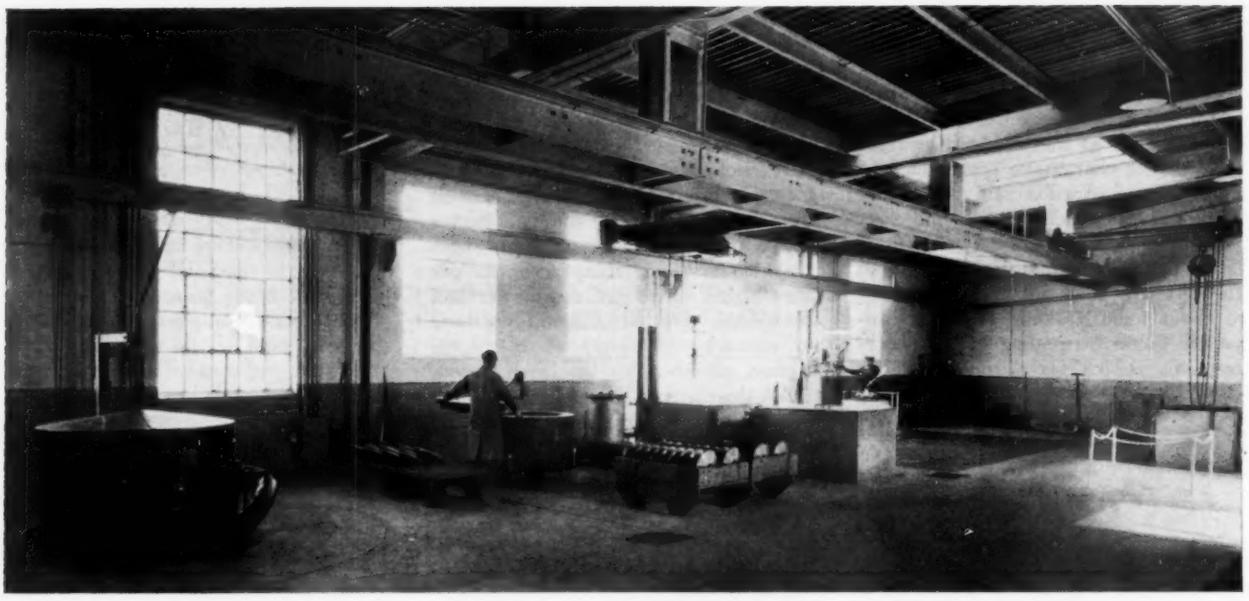
The effect of a mistake in the conversion factor is exactly the same as changing the labor rates. It would shift the region where the wrong file might possibly be chosen; but the actual penalty for this wrong choice would have a maximum value of approximately 3 per cent.

It is proposed that the commercial valuation of a file be based on the theoretical cubic inches per dollar calculated from the mechanical rating on the assumption that 1,250 strokes is equivalent to an hour of hand labor. Then

$$E = \frac{W}{aP + L}$$

where E is the commercial rating (theoretical cubic inches per dollar); W the cubic inches for 1,250 strokes of the average side; a the decimal fraction relating the strip tested on one side to the total useful area of both sides; P the price of the file in question; and L the labor rate.

The best commercial life as shown on Fig. 3 would not be correct if key steel were used instead of standard bar. A much slower file deterioration would then take place and the economic life would be greater; on the other hand the question of speed would be relatively even more important, because the file price would form a smaller proportion of the total cost. Where a process such as resharpening or recutting is in use, the salvaged product should be subjected to just the same tests as the original purchase.



Equipment for nitriding, air tempering, cleaning and carburizing is arranged along the outer wall

VERSATILE METHODS MAKE A VARIABLE DRIVE

II—A new heat-treating department, set up for the latest hardening methods, contributes to the durability of the Link-Belt Company's P.I.V. Gear

JOHN HAYDOCK
Managing Editor

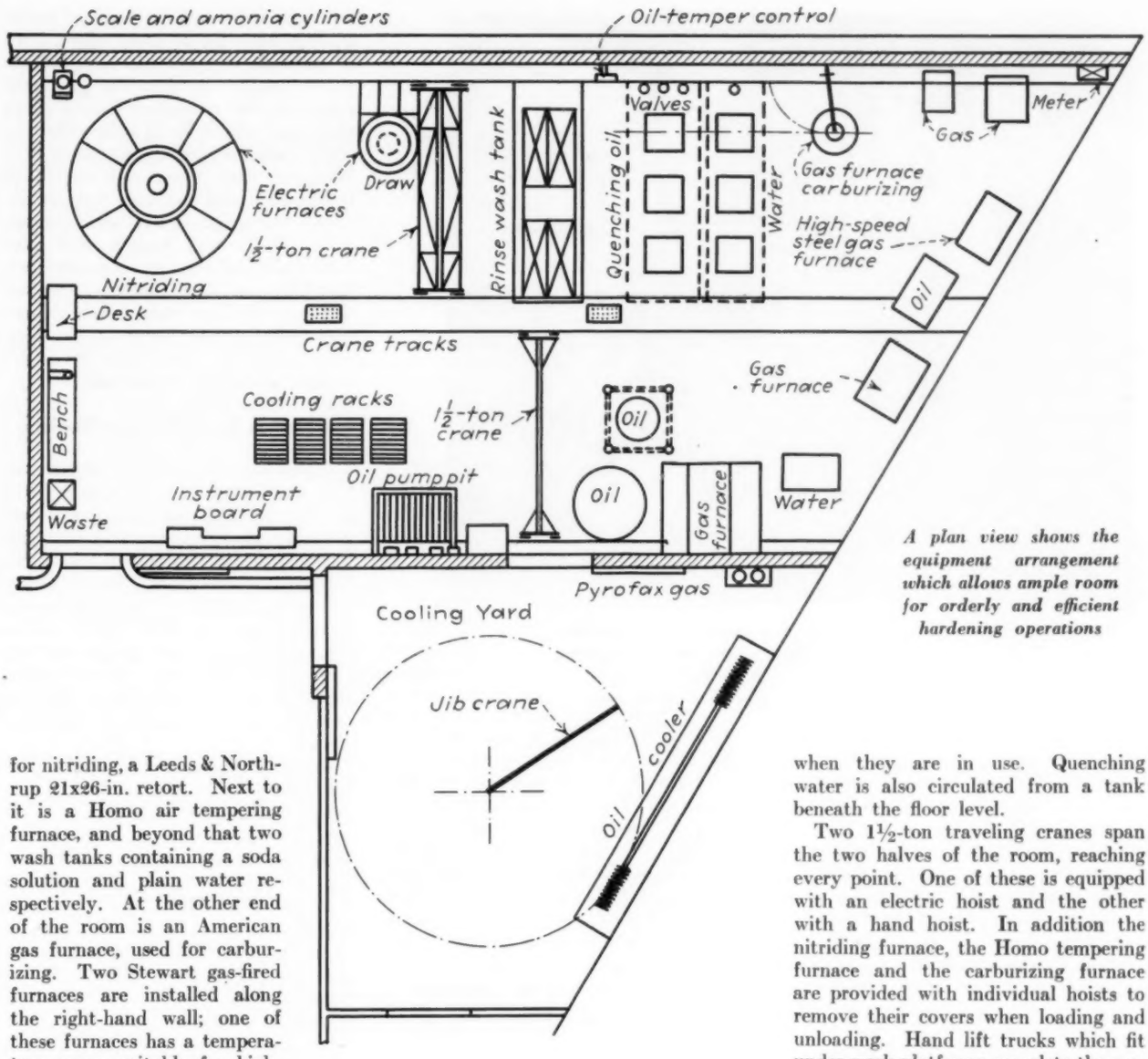
MACHINING methods were described in the first article on the Link-Belt Company's P.I.V. Gear. The care reflected in these operations is carried out in selecting materials for the parts of this transmission unit and in heat-treating these materials to bring out the desired physical properties.

In laying out the new department for manufacturing the P.I.V. Gear at this company's Philadelphia plant, especial attention was given the arrangement and selection of equipment in the heat-treating section. A great variety of parts pass through this equipment, but in describing its operation the wheel faces which comprise so vital a part of this unit will be employed as an example.

Wheel faces for the smaller sizes, Nos. 0, 1 and 2, are made of molybdenum steel corresponding closely to SAE specification 4615; they are carburized and hardened. For units Nos. 3, 4 and 5, Nitralloy G is the material for the wheel faces, and it is nitrided in accordance with approved practice.

A plan view of the heat-treating section is given here in order that the convenient working arrangements may be visualized. The room containing this equipment is entirely inclosed with glass to prevent any smoke or fumes from entering the machining department. However, with the clean operation possible in the modern units with which this department is equipped the partitioning seems almost unnecessary.

At one end of the room is the set-up



A plan view shows the equipment arrangement which allows ample room for orderly and efficient hardening operations

for nitriding, a Leeds & Northrup 21x26-in. retort. Next to it is a Homo air tempering furnace, and beyond that two wash tanks containing a soda solution and plain water respectively. At the other end of the room is an American gas furnace, used for carburizing. Two Stewart gas-fired furnaces are installed along the right-hand wall; one of these furnaces has a temperature range suitable for high-speed steel.

In the corner near the wall opposite the windows is a Surface Combustion 36x36-in. gas-fired furnace. The control equipment is mounted on a panel along this same wall. With the exception of the two Stewart furnaces all heating equipment is provided with automatic temperature control. In addition, the nitriding furnace, the air tempering furnace and the gas carburizing furnace are equipped with recording devices.

Processes which are run over night are provided with duplicate control equipment which automatically functions if the main control fails. This precaution insures against spoilage.

Layout of the quenching equipment in the heat-treating department reflects unusual care. Between the cleaning tanks and the American gas furnace are two 5x16-ft. rectangular tanks, sunk into the floor and covered with steel plates when not in use. A circular oil furnace is sunk into the floor near the front of the Surface Combustion furnace. In addition there are three quenching tanks about 40 in. above floor level. One of these is at the side of this same furnace near the wall and contains oil. Another, a rectangular tank, contains water and is situated between the Surface Combustion furnace and one of the Stewart furnaces.

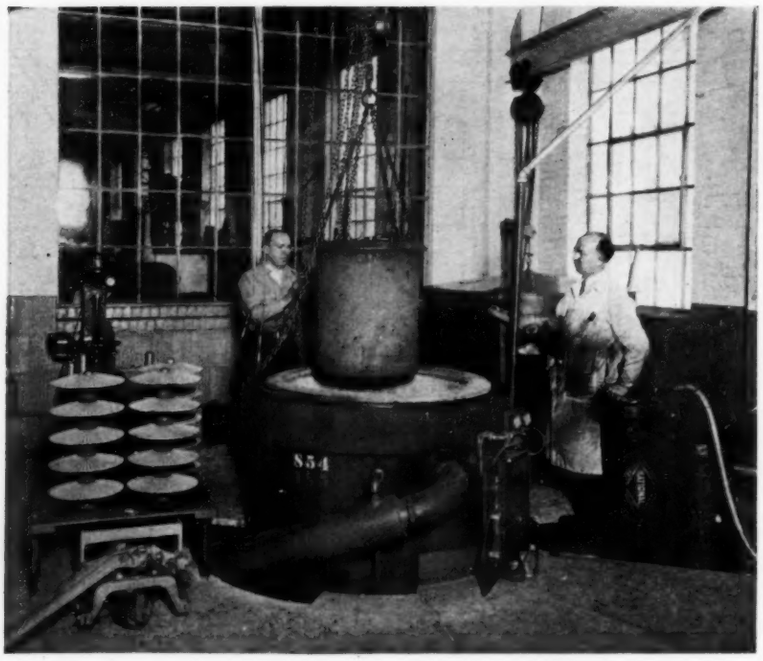
Just outside the wall of the building is a complete cooling system for the quenching oil. The oil passes through a bank of aerofin coils and may be air cooled in cold weather or water cooled in warm weather. Pumps installed in a pit beneath the floor circulate the oil through the coils and to the tanks when they are in use. Quenching water is also circulated from a tank beneath the floor level.

Two 1½-ton traveling cranes span the two halves of the room, reaching every point. One of these is equipped with an electric hoist and the other with a hand hoist. In addition the nitriding furnace, the Homo tempering furnace and the carburizing furnace are provided with individual hoists to remove their covers when loading and unloading. Hand lift trucks which fit under work platforms complete the material handling equipment.

The department is equipped with an Olsen Brinnel machine and a Rockwell superficial hardness tester for checking the results of heat-treatment.

Great care is exercised to make sure that the forged wheel faces made of Nitralloy are thoroughly normalized. In the rough state they are first heated to about 1850 F. and held there for two hours. After air cooling they are reheated to 1750 F. and quenched in oil; then they are drawn at 1275 F. for about three hours. After the parts are rough machined they are again drawn for strain relief at 1050 F. for two hours.

These preliminary treatments put the work in condition for the nitriding operation, which follows cutting of the grooves. In fact no machining is done after nitriding except to grind the bear-



In the glass inclosed hardening room, a pot containing wheel faces is being loaded into the nitriding furnace

ing surface. Because the parts grow slightly from the absorption of nitrogen they are cut a few thousandths undersize in the finishing machine cuts.

Nitriding is done at about 1000 F. The work is inclosed in a Nichrome box to which ammonia gas is admitted. The treatment takes 90 hours, producing a 0.031 in. case which is hardest at the surface.

The smaller wheel faces which are molybdenum steel, carburized, are heated to 1680 F. in an atmosphere of city gas enriched with Pyrofax. The parts are air cooled, reheated to 1450 F. and oil quenched. A draw of 325-350 F. completes the treatment.

Wheel faces are only one of many hundreds of parts that go through this department. But so carefully is the work controlled that few parts fail to conform to the hardness specified. All of this is done in a setting that is a model of cleanliness and orderliness.

Japan Makes Its Own Tools

ONE OF the problems of machine tool builders is the volume of export business to be expected, now and in the future. Data recently received from a Japanese correspondent are of great interest to those with whom export business plays an important part. Figures of imports for the past few years are available as to imports, but no figures are available as to Japanese manufacture of machine tools since 1933. The figures follow:

	1931	1932	1933
Machines made in Japan.....	3,900,000 yen	8,200,000 yen	15,400,000 yen
Machines imported	3,070,000	5,810,000	16,250,000

It is interesting to note that imports and domestic manufacture are approximately the same for 1931 and 1932 and that, while home production has increased materially, this increase has been practically matched by imports. In 1934 the imports increased to 21,-430,000 yen.

There is also an interesting story in the production of such small tools as drills, reamers, taps and cutters of various kinds. The increased demand for these tools, and for tools of better quality, have led to great effort, both in research and manufacture, to improve quality in domestic products. Japan is now producing special alloys and tungsten carbide. Considering that home manufacture dates back only to 1912 and that it was not until 1921 that special tool factories were established, the progress has been remarkable. Drills with carbide tips have been made and seem to be satisfactory. Recalling our own experience in this line may indicate that longer experience in Japan may be necessary. Diamond tools are also being made for bakelite and similar materials.

Makes Own Carbide Tools

Japan has improved her carbon and high-speed steels as well as tools of the carbide type. Carbon steel is still considerably used for taps and dies, but its use is decreasing as with us. Their tungsten-carbide tools were originally of German origin, but domestic manufacture began in 1926. This has increased until Japanese carbide tools are now in the majority. These cutting tools are now used in about half the quantity of those made of high-speed steel.

Production of tools of these materials has more than doubled since 1930, the grand total for 1933 being 2,758,313 yen. The production of such tools as taps, dies, drills, reamers, milling and gear cutters and chasers increased from 1,403,363 yen in 1930 to 3,871,581 yen in 1933.

Among the tools largely imported are those of Brown & Sharpe Manufacturing Company, B.S.A. Company of England, Cleveland Twist Drill Company, Fellows Gear Shaper Company, Pratt & Whitney Company, Reinecker Company of Germany, L. S. Starrett Company, and Standard Tool Company. Imports of these tools have varied widely, being 493,591 yen in 1930, 217,225 yen in 1932 and up to 453,927 yen again in 1933. But even this is less than an eighth of the tools made at home in the same year, showing Japanese industrial progress.

Statements regarding steel importation vary widely. One authority says that only high-speed steel is imported, another that considerable carbon steel is still being purchased from other countries. Japan urges the supplying of home markets entirely with Japanese goods, and cites America as an example of this policy. The effect of such policies on world export trade, must be carefully considered by manufacturers in all countries now exporting industrial goods to Japan.

Talking Shop

Turbine for Tramps

An all-turbine unit, intended for use on tramp steamers and similar vessels, has been designed by the Tyneside firm of Parsons Marine Steam Turbine Co., according to *Industrial Britain*. Hitherto the turbine has been regarded as the preserve of the ocean liner. Exhaustive tests in the company's yard have now been completed satisfactorily, and the new turbine is being fitted in a cargo ship at present being built.

One Detroit automobile builder has been providing the services of 15 tax experts to help job setters, assistant foremen, foremen and others to fill out their returns for 1935. Long lines formed in the shops at quitting time to take advantage of this aid. An industry that pays enough to job setters to require income tax returns is invaluable to its community and to the country.

Traditional Tests

On the whole the technical testing done under supervision of the I.C.C. has been well done and has improved safety conditions on the railroads. But every bureaucracy succumbs to tradition and this one is no exception. Hammer testing of pressure vessels and reservoirs is traditional. It is probably satisfactory so long as materials of construction continue to be substantially the same as those for which the test was designed. But when aluminum or

stainless steel is used instead of the conventional carbon steel the test falls down because it is destructive of either of those substances. When this fact was pointed out to the inspectors the priceless answer was, "Why did you make the tanks of a material that couldn't be hammer tested?" And there are idiots who want to increase government control over industry!

Increasing Power!

There doesn't seem to be much relation between inventors and those who play the stock market. But they often have one trait in common—the idea of getting something for nothing. Special gearing that is not only 100 per cent efficient but actually increases the power delivered by the prime mover, is one of the favorite forms of self-delusion. There are times, as in the overdrive for motor cars, where gearing gives excellent results. This is not done by increasing power, as some seem to think, but rather by using the power more efficiently under certain conditions. When we get to thinking that our invention, or design, *increases power*, it is time to call in a competent engineer, or an alienist. For if, and when, we begin to increase power, perpetual motion is just around the corner.

Joseph's dream of the seven fat and seven lean kine may still have significance; at least W. J. Cameron, Henry Ford's radio spokesman, thinks so. In his Sunday night talk, "Will Hard Times Come Again?" he showed that the seven slow years since 1929 were supported by the reserves developed in the seven active years before 1929. He also pointed out that, "The people's surplus is always a government resource, but when private resources are absorbed by the government they never serve their real purpose again."

Accidental Discovery

Just how large a part accident plays in the discovery of new devices or practices will probably never be known—partly because some of us hesitate to admit that we didn't carefully reason the thing out in true professional fashion. But we can recall several discoveries and designs which, according to persistent rumor at least, were pure accidents. One was the Taylor-White heat-treatment process and another a certain gear shift that claimed—and in fact had—several real advantages over our present standard.

And now comes W. P. Woodside, vice-president of the Climax Molybdenum Company, who admits that the double heat-treating of steel was a pure accident, and tells how it came about in a recent issue of *Metal Progress*. There are a lot of such interesting stories that ought to be told. Who's next?

Welding has conquered stubborn resistance in one field after another, even the Navy, but has only just made its first dent in the tough shell of the locomotive boiler inspectors. They have not approved welding for locomotive boilers but they have raised no objections to a proposal to build one for experimental purposes. It should be on the rails by summer.

Hint for Inventors

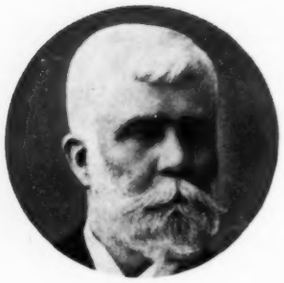
The good old trick of sprinkling a little salt in beer of a summer's day got high-brow scientific approval in Detroit the other day when Dr. Roy D. McClure, of the Henry Ford Hospital, told visiting physicians that

salt tablets put in drinking water was "simple insurance" against heat prostrations in hot metal-working plants. A box of salt tablets put near drinking fountains reduced heat prostrations from about 400 a day to four or five in an automobile plant last summer. Now for a salt tablet that makes a drink of water taste like a seidel of foaming brew! —*The Editors.*

MEN I HAVE KNOWN

III—Memories of men persist after memories of events have faded. In the course of his work a technical editor meets many men and forms friendships that last through life

FRED H. COLVIN
Editor



ONE of the compensations of being an old-timer is in the memories of those one has known, of those who played a part in bringing the machine tool industry to its present high estate. Here again I shall not even try to be chronological or to rate them as to importance, if that were possible. And I shall probably miss a number who should be included. Who knows to what extent a small part played by one man has affected great development by others?

Most of the men I knew in the early days have passed on. But they have left pleasant and more or less valuable recollections. Their influence on machine tools, and on me, can best be judged by others. An early letter of mine in *American Machinist* advocating wire sizes based on decimal diameters instead of arbitrary numbers put me in contact with Oberlin Smith of Ferracute Machine Company who had similar ideas, and this friendship lasted during his lifetime. Oberlin had the first garage door opener I ever saw. As he drove into the yard he stopped at his porch and touched a button. This button started a motor that opened the garage doors by the time he got there.

Amos Whitney of Pratt & Whitney, and Charles Billings of Billings & Spencer, as well as Coleman Sellers, were among my early acquaintances. And I now enjoy the friendship of Coleman Sellers, 3rd, spanning 50 years in the same family.

A similar case is that of the Vialls of Brown & Sharpe. I knew Richmond Viall slightly while he was still active. His son William I have known for many years and now William's son, Richmond, is in the picture, following the family tradition. Frederick Miles, William Bement, William Newton, the Putnam Brothers and the elder Flather, all pioneers in machine tool development in the early days, were also among my early acquaintances, even though I never knew them particularly well.

B. & S. Old Guard

Returning to Brown & Sharpe for a moment, I have many pleasant recollections of Oscar Beale, a frequent contributor to *American Machinist* and an authority on gears, of John Parker who helped develop the milling machines, of Fred Anthony of the screw machine division, of Luther Burlingame who was one of our party of engineers in Japan in 1929, of Hugh MacGregor, and a number of others.

I knew Amos Brainard, whose milling machines were well known in his day, and who was always most considerate to me as a cub editor. It was in

his shop that I first met John Bath, who became one of my very good friends. This friendship has been extended to his sons. I next found him at Norton's and later in his own business. We had much in common. Among John Bath's contributions were his "indicator," his development of grinding machines, and his gages and micrometers.

John Becker was another milling machine man of the early days. He perhaps did more to establish the vertical miller as a manufacturing machine than any other single man. I knew him in Fitchburg, Mass., before the consolidation with Brainard, in Hyde Park, and last saw him there, at his home, shortly before he retired.

In Worcester there was Fred Reed, of the famous Reed engine lathe and his superintendent, John Back. Also Blaisdell, the Prentice Brothers, Charlie Hildreth, Whitcomb, Woodward and Powell, Snyder, Stockbridge and many others. Among them and with a friendship that covered many years, was James Heald, "Jim" to his friends, whose memory is still fresh in many hearts. Charles Norton, whom I first knew at Brown & Sharpe and now retired, was one of the early advocates of grinding as a real machining operation. To most of us it had previously meant removing a very small amount of metal

and making many sparks. Both Heald and Norton have left a mark on the art of grinding. The Heald boys are carrying on the good work, aided by Massey and others, as is Howard Dunbar of Norton, and his assistants.

From both Brown & Sharpe and Pratt & Whitney have come many men who made a lasting impression on the machine tool industry. From such parentage grew concerns like Beaman & Smith, Warner & Swasey, Kearney & Trecker, Kempsmith and many others. The Beaman & Smith Company played a part in developing special boring and milling machines for the automobile industry in its early days. Ed. Kearney and Theodore Trecker made a name for themselves in milling machines, which Trecker still carries on.

Cleveland and Cincinnati

In Cleveland I first met John J. Grant when he was making balls for bearings. I had known of him for some years through his writing in *American Machinist* and his work at Simonds in Fitchburg, both in ball making and thread rolling. Grant was a very early contributor to *American Machinist* and was in a number of machine building ventures, such as Grant & Bogert, Grant-Lees and the Franklin Machine Company. We were friends for many years. Then there was John Brophy, formerly of Cleveland Automatic Machine Company, always a character and full of ideas. "Gene" Peck of Cleveland Twist Drill Company, and Jacob Fox, father of the present manager, were both old friends, but since Gene retired from active work I have seen little of him. Henry Lucas, a former apprentice of Warner & Swasey, has been a close friend for many years. Henry and I met through Walter Cheney, who sold Lucas machines for many years. Walter was one of my best friends for well over thirty years. A graduate of Pratt & Whitney, a close friend of Amos and Clarence Whitney and most of the old timers of that era, he was not only an excellent mechanic and designer, but one of the squarest shooters I have ever known. I owe him much as a mentor when I was a youngster in the field. George Yost, also of Lucas, is another of my old friends.

Cincinnati recalls Uncle Billy Lodge, his old-time partner, William Barker, and Murray Shipley, of later date, Wm. E. Gang and Doctor Dreses, both of whom made radial drills, and Perrin G. March of the Shaper Company. Also E. A. Schumacher, his superintendent and successor, Bill Emmes, F. W. Boye, Jr., and William Heindl, who still runs the Cincinnati Lathe Company. Then there was Fred A. Geier who successfully piloted the Cincinnati Milling Machine Company for a half century.

Young Fred is carrying on. Here I first met A. L. DeLeeuw, whose friendship dates back many years, and still continues.

Next door is Bert Quillen and George Langen, friends for many years, while Gus Tuechter, another half centuryite, still holds forth in the next shop. Not far away is Ed Muller of the King Machine Company. Our friendship dates back to Springfield, Ohio, when Ed was superintendent for the elder Montanus, well over 30 years ago.

Among my early mechanical friends was S. Ashton Hand, then a builder of lathes near Philadelphia. Since then I have known him in various capacities which include expert photographer and works manager of a well known printing press plant. Since 1919 he has been a co-worker on *American Machinist*. Ashton was one of my sponsors in joining the A.S.M.E. over 40 years ago. He reaches the 80th milestone this month.

Many of the good friends of my younger days came through the American Society of Mechanical Engineers. No society ever had a more genial secretary than Prof. Frederick Hutton who never forgot a name, or a face, and made all comers feel as though they belonged. Joining as a junior while still in my twenties and ineligible for full membership, I shall never forget the kindness and consideration shown by many of the older members. My youthful appearance in the early editorial days led me to try the old experiment of wearing a beard, which was not uncommon then, to add to my appearance of age, if not of dignity. Fortunately no photograph of this era is now in existence.

Through these meetings I made many interesting and valuable acquaintances,

mainly among men much older than I, most of whom passed to their reward years ago. The outstanding survivor is our beloved Ambrose Swasey of Cleveland, always helpful to younger men.

Here I met such men as Professor Robert Thurston, Professor John E. Sweet, John Brashear of lens grinding fame who was a most lovable character, Samuel Wellman of Wellman & Seaver, C. W. Hunt, John Fritz, and many others. Among them was Admiral Melville, Arctic explorer who, as president, was decidedly irked at not having members gather promptly at the appointed hour for our meeting. Here I first met Professor John H. Barr, then of Cornell, A. H. Carpenter of Acme Machinery Company, and many others. These contacts were very valuable as they gave me sources of information,

• Upper row, left to right: Oscar J. Beal, John J. Grant, S. Ashton Hand and Ambrose Swasey

• Lower row, left to right: L. S. Starrett, John E. Sweet, G. T. Wellman and James Hartness

which are always much to be desired.

Others who stand out vividly in memory of those who have passed to the great beyond are Charles Porter of the Porter-Allen stationary engine, Hugo Bilgram and William Gleason, both of bevel gear fame, Ulrich and Henry Eberhardt, both originally of Gould and Eberhardt, Charles Newton, of the Newton Machine Tool Company, then of Philadelphia, James Hartness of Jones & Lamson, L. S. Starrett, Worcester Warner, and a host of others.

Mr. Warner lived next door to Ambrose Swasey on Euclid Ave.—then a resident section, now given over to business. My first visit to Cleveland was brightened by dining with the Warner family, a kindness to a very young editor that will never be forgotten. Rumor has it that as long as Warner & Swasey was a partnership there was never a contract or a written agreement between them—nothing but the verbal understanding that everything was 50/50 and that the survivor would carry on in case of eventualities, an outstanding example of faith that is seldom equaled. May Ambrose Swasey long be with us.

The names of Winthrop Ingersoll, Fred Kempsmith and Ed Kearney rather group themselves geographically. Ingersoll was a pioneer in the building of planer type millers and heavy surfacing with inserted tooth cutters. The loss of his son during the war was a terrible blow from which he never entirely recovered. Fred Kempsmith, too, a product of Pratt & Whitney, of about the same period as Walter Cheney, John Grant and George Bond, was saddened by the death of a son, in addition to loss of eyesight before he really reached middle age. Ed Kearney was too well known and his passing is too recent to need elaboration.

Left to right: T. R. Almond, Stoddard E. Horton and Eli Horton

John Grant was a man of many parts. One of his early ventures was in the making of taps in Greenfield, Mass., the beginning of that industry in that city. His one-man shop later became the Wiley & Russell Company, where Frank O. Wells learned his trade, and was proud of the fact that "he served his apprenticeship under Johnny Grant." A recent visit to Herbert M. Darling, superintendent of the Wells Tool Company, disclosed the fact that his desk is in the very room in which Grant started his little shop. Frank Wells kept in touch with Grant all through the years, visiting him in Plainville, Conn., a short time before his death. And now Frank and his brother Fred have both gone. And so have Eli Horton and his son Stoddard, chuck makers, and T. R. Almond, one of the first micrometer manufacturers.

Another early tap maker whom I knew well in my younger days was J. M. Carpenter of Pawtucket, R. I. J. M. was a mechanic of the old school, who was much happier when his shop was small than after it grew larger. He was an example of the old adage that nothing stands still. It either goes forward or backward. And in spite of his efforts to keep it small, it grew beyond his desires.

Milling and Grinding

New methods require enthusiasts to bring them into the limelight. John Grant preached and predicted the use of the milling machine for nearly all surfacing work while the rest of us regarded it largely as a toolroom ma-

chine. He lived to see his predictions verified to a marked degree. Charles Norton was one of the great enthusiasts for grinding before most of us realized its possibilities. Beginning with the conventional grinding machine when I first knew him, perhaps 40 years ago, he visioned the grinding wheel as a tool which could and would replace the turning tool and make the lathe unnecessary in many operations. He ground automobile crankshafts direct from the rough in some of his machines of long ago. And though this extreme use of grinding has given way to rough turning in most cases, there are even now operations in the Ford plant where the center bearing is ground from the rough. Perhaps we shall yet see his predictions prevail.

Speaking of Charles Norton brings to mind his brother, whose quick change gear box was one of the first, if not the first, to be used on the engine lathe. It also recalls Henry M. Leland, who was associated with Norton and Faulkner building machinery, and later, the engines for the early Cadillac cars. Both Norton and Leland were very positive characters and it is not surprising that they did not remain in partnership. That each appreciated the other's ability, however, is shown by the fact that Leland always bought Norton grinders and Norton bought Cadillac cars.

I met L. S. Starrett about 40 years ago while he was still in the old wooden shop with water power, if I am not mistaken. Those who knew him will recall that he always carried a pad and pencil for visitors to write questions or answers. This, it was rumored, was not only because he was hard of hearing but to have a record of the con-

versations as well. I was told that he started business by making an apple parer, which makes his growth into the fine tool line all the more noteworthy.

From the Morse Twist Drill and Machine Company, came John McGregor and John Boynton. I met them at the Harrington shop in Philadelphia where they had joined Hal Norris in the endeavor to make the Harrington drilling machines foremost in that line. The two Jones went to Athol at the formation of the Union Twist Drill Company, and Hal Norris went to Cincinnati to the Bickford Company, remaining with the new Cincinnati Bickford Tool Company until his death. Hal designed the change gear box that made his machine distinctive for a time. This gear box is supposed to be the basis for the present automobile transmission.

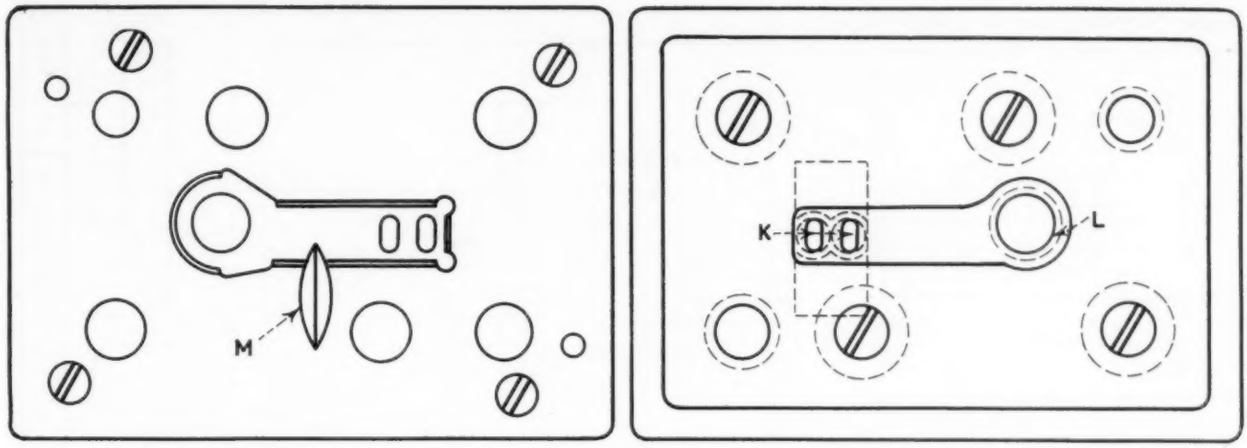
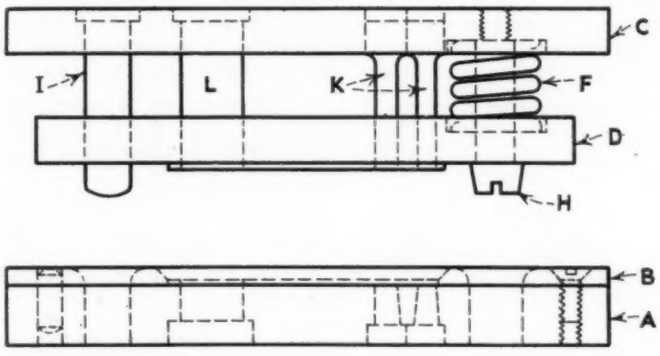


Fig. 15—In this unmounted pierce die the upper and lower members are maintained in alignment by using pilot pins



IV—Piercing dies make holes in strip, in sheet or in previously blanked parts. These dies require accurate alignment and backing up of the punches

DIE DESIGN and DIE MAKING

PIERCE DIES differ from blank dies in that the slug is not used. Such dies are employed to punch holes in parts that are blanked from the sheet or strip. Piercing can be done either in a separate die or combined with other operations. For example, piercing and blanking can be done in stages in a progressive die, or simultaneously in a compound die.

In contrast with a blanking die, the punch of a piercing die regulates the size of the hole. The die block in this case is machined to give the necessary stock clearance. The die should be designed so that the blank burr is down. Thus, pierce and blank burrs will be on the same side of the stock.

Piercing punches should be made to pierce to the high limit so that as they wear the holes produced will still remain within the limits on the part print. To effect this, make the piercers larger than the high limit by 0.001 in. per ⅛ in. of stock thickness.

E. G. MARSHALL

Master Mechanic, Charleston Works, The American Fork & Hoe Company

Pierce dies are made in many forms, the selection depending on the production required, the shape of the part and the amount that can be invested. A simple form is the unmounted pierce die, which like the unmounted blank die, is used where production is limited and the tool cost must be kept at a minimum. Fig. 15 is a typical example. This die is intended to be used between planish blocks.

The punch press is equipped with a loading table, and the pierce die is operated like the temporary blank die shown in Fig. 6 (*AM*—Vol. 80, p. 305). The blanks are placed in the nest on the lower member, the top member placed on it and the press is tripped. The two members are held in alignment by guide pins.

This type of die is composed of a die block *A*, a nest plate *B*, a punch plate *C*, a stripper plate *D*, stripper springs *F*, stripper screws *H*, pilot pins *I*, and piercers *K* and *L*. If any number of such dies are to be made, and if many of them are nearly of the same size, a few standard die blocks, strippers and punch plates can be made up and carried in stock.

The die block *A* was made of ⅝-in. oil-hardening tool steel and $\frac{1}{16}$ in. shaped off each side to a finished thickness of ½ in. The top surface was ground smooth for layout purposes, and heated to a blue color to emphasize the scriber lines.

There are two ways of going about making this die. If there is a jig borer in the shop, the die block, the stripper and the punch plate can be clamped together, and the pilot pins, round piercers, and the internal radii on all

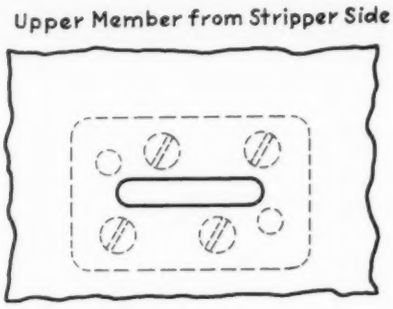


FIG. 16

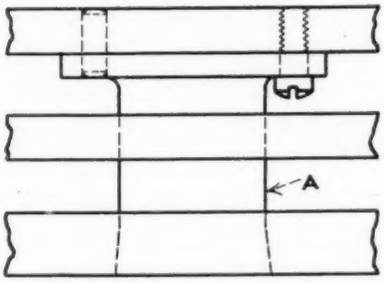


Fig. 16—By flanging the head and backing up against the punch plate, piercers for slots and large irregular holes are made to give good service

slots can be bored at one clamping. Plugs can then be fitted in the holes in the die block and any straight lines or other lines added with a vernier height gage. If there is no jig borer available, layout and finish the die block first. Then, depending on the accuracy required, the holes can be laid out according to the methods described for templet making (*AM*—Vol. 80, p. 259). By an alternate method buttons can be attached and located to the block and the block trued up on the face plate of a lathe and bored.

The die block can be bored, drilled and filed according to the shape of the pierced holes. Make the piercing holes in the die block larger than the piercers, according to the allowance for stock thickness as previously explained on the blank dies (*AM*—Vol. 80, p. 259). Use ¼ deg. taper clearance angle on each side of the piercing openings. Counterbore slug clearance on the bottom of these holes equal in depth to the thickness of two slugs.

The nest plate should be made of cold-rolled steel with a minimum thickness of ⅛ in. in any case, and as thick as the stock if it is greater than ⅛ in. When the stock is thinner than ⅛ in., use the ⅛-in. nest plate, and rivet a blank to the stripper equal in thickness to the difference between the nest plate and the stock thickness.

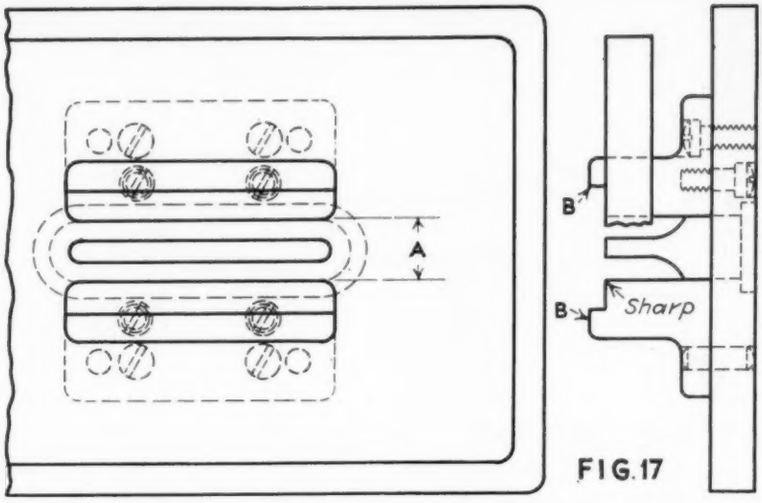


FIG. 17

Fig. 17—Dimension A should be small enough so that back up punches will shave 0.005 in. on each side for a stock thickness of ¼ in. Note on tool drawings that in case of cut-off dimension A should be 0.010 in. smaller (on ⅛-in. stock) than the low limit of raw stock width

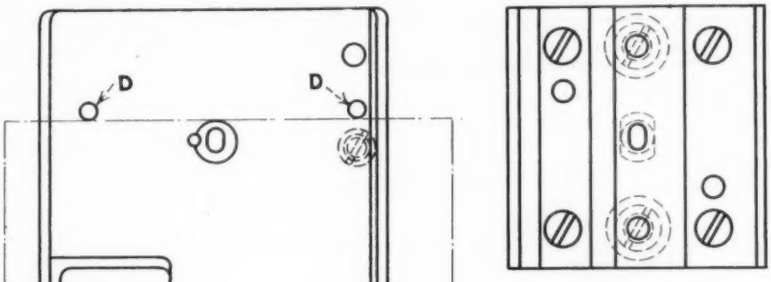


Fig. 18—Cutting portion B of the die block is a hardened and ground insert, the remainder being soft steel. The punch K is backed up against a plate H

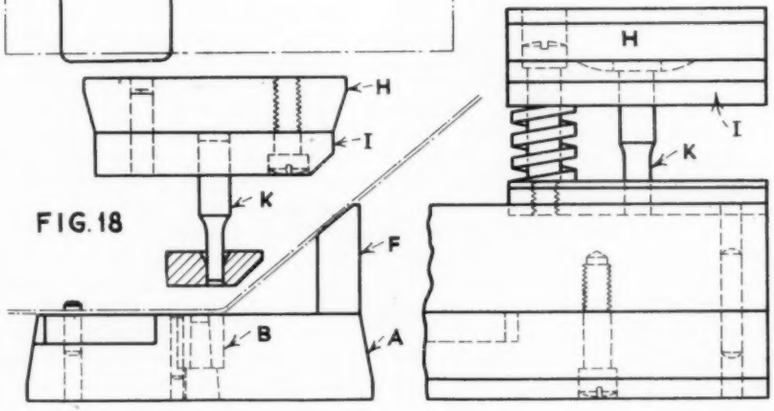


FIG. 18

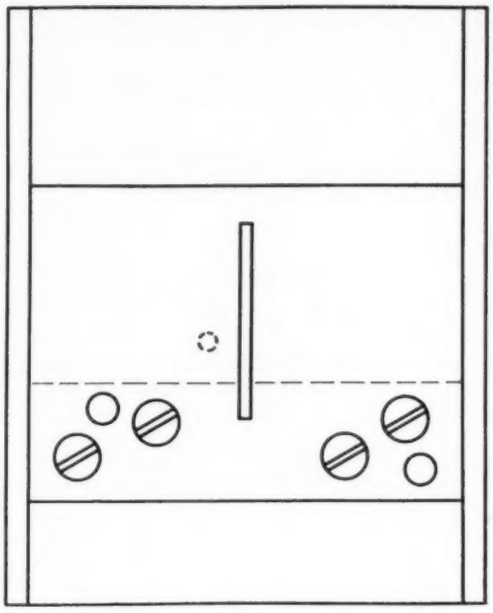
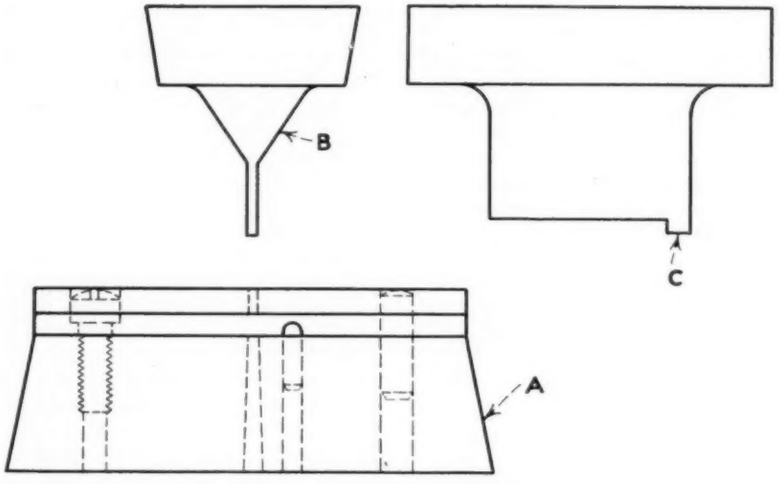


Fig. 19—A heel C on the punch enters the die before the remainder strikes the stock, giving alignment on long slender notching punches

FIG. 19



Bevel all working edges of the nest plate, and caseharden to resist wear. To attach the nest plate use 8-32 flathead screws and ⅛-in. dowels. In large dies ⅜-in. dowels are sometimes used. The pick out groove *M* is used in removing the part.

Punch plate *C* is made from cold-rolled steel ⅜ in. thick and of the same width and length as the die block. Piercer *L* and pilot pins *I* are mounted in this plate with a drive fit. They have a heel on the back to prevent pulling out when stripping. In the case of an irregular shaped piercer, make the section in the punch plate at least 1/32 in. larger than the working end. Then drive the punch in the punch plate and layout from the finished die block, finishing to the line.

The stripper *D* is mounted on the punch plate by the screws *H* and is held under tension by springs *F*. The stripper is a snug sliding fit on the pilot pins and piercers and in this way acts to guide the piercers. In addition, the stripper is ¼ in. smaller on all sides than the die block to allow a hand hold in taking the two apart.

When a pierce die is designed, the stripper springs should be grouped as close to the piercers as possible, to avoid bending the stripper. If the springs are grouped around the edge and the piercers are in the center, the stripper will cup like a saucer. Stripper springs are assembled with an initial compression of ⅛ in. The springs should be designed so that they have at least ¼ in. travel before closing to the shut height. It should be noted that the amount of travel before the springs close is the amount that the piercers can go through the part plus the amount that can be ground off in sharpening. Stripper screws are threaded into the punch plate, and the head is on the lower side of the stripper. Clearance is provided in the die block for the stripper screw heads.

Although it can be done, the piercing of a hole smaller in diameter than the thickness of the stock is never recommended.

THERE are precautions to be observed in making pierce dies. In the case of piercers other than round ones, mill a flat on the heel and a slot in the punch plate to prevent them from turning. They can be rough finished and driven into the punch plate, then sheared into the die, removed and hardened, and then replaced. Sometimes a small hole is drilled half in the punch and half in the plate, and a dowel driven in instead of the flats. Grind the top of the assembled die so that the top and bottom are parallel and the piercer heels are flush.

Because of the tendency among die makers to peen the punch plate to align the punches, the punch shown in Fig. 16, at *A* is recommended. This type is mounted on the punch plate with screws and dowels. Besides being easier to line up, it has a better back up; in other words, more area to take the force of the blow. Fig. 17 shows a slot piercer that had to be backed up. In piercing the slot the stock would spread. To back up the piercer a punch was mounted on each side as at *B*. Because of the small space available it was necessary to mount the piercer in the punch plate. The back-up punches are supposed to cut a little off each side as the piercer cuts. This type of back up should always be used when shaving a slot.

Fig. 18 is a working drawing of a pierce die made for use in a universal holder. As mentioned earlier this type of die gets its alignment from the punch press, and therefore the press must be in good condition. Play in the ram must be at a minimum and the surface of the bolster must be at right angles to the ram and also perfectly flat.

The die block *A* is made from machine steel and the working parts are inserts. The cutting edge on the lower member is a tool steel bushing *B*, be-

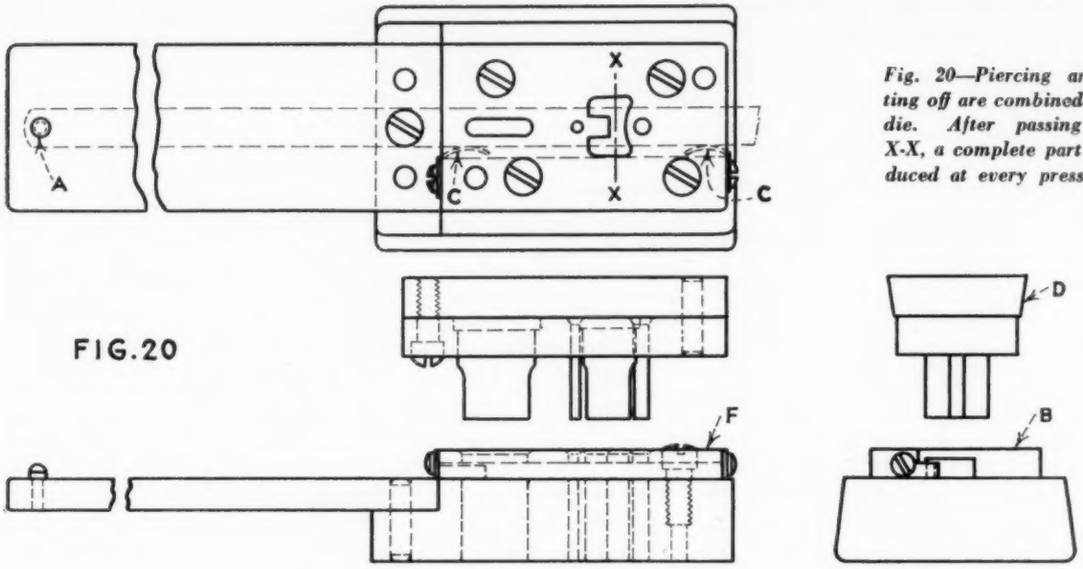


FIG.20

Fig. 20—Piercing and cutting off are combined in one die. After passing point X-X, a complete part is produced at every press stroke

ing made a drive fit in the soft die block. The opening in the bushing has the top ⅛ in. straight to prevent the slugs pulling back up with the punch. The balance of the hole in the insert has a ¼ deg. taper on each side, with ½ deg. taper in the die block. The advantage of the taper is that the slugs cannot stick and break the die.

Location of the part from left to right is obtained by pin *C* made of drill rod, and by two dowels *D* at the back edge of the part. To support the weight of that portion of the work which is bent up at an angle, bar *F* is attached to the side of the die block and the top of it is machined to suit. Punch *K* is mounted against the base *H*, as are the stripper screws and springs. The punch plate *I* is attached to the sub base *H* with screws and dowels. Part *H* is machined to suit a universal holder.

A die for the same sort of work can be made more cheaply by attaching the stripper to the die block. Moreover, the punch has a round shank to fit a standard adapter.

A notch die designed for use with a universal holder is shown in Fig. 19. Die block *A* is made of tool steel hardened and ground, and the spacer is thick enough to permit easy loading of the work. The stripper and spacer are attached by means of screws and dowels. Punch *B*, made in one piece, is machined to fit the universal holder. Note the taper from the working end to the base in order to give strength. The punch has a heel at *C* to guide it in the die and to support it before the cut starts. It is good practice where any punch cuts only on one side to use a heel on the other to prevent springing.

A piercing and cutting-off die is shown in Fig. 20. In this case the punch trims a tongue on one end of the piece and a radius on the other end. The stock is fed in from the right to the center as at *X-X*, the end is trimmed and the first hole is pierced. The stock is then shoved forward to the locating pin *A* and the first hole is placed over this pin. When the press is tripped a second time, the piece is cut off, the tongue trimmed, and the slot and one hole are pierced. The stock is guided at the back by the spacer and on the front by springs *C*.

Because the cutting edges are in the die block and not in bushings or inserts, the die block is made of tool steel, hardened and ground. As the piercers and the cut-off punch regulate the size of the part, the openings in the die are made large enough to allow for clearance, due to thickness of the stock. When the dowel holes are reamed in the die block, stock is allowed for lapping. Screw holes are tapped with a 0.003 in. oversize tap. One end of the die block is milled to receive the support plate that carries the locating pin *A*.

The stock guides are made of cold-rolled steel, and are ⅛ in. thicker than the stock. The upper base *D* is machined to fit the universal holders, and on it is mounted the punch plate in which are the piercers. The punches are finished to shape right down to the heel. It is then necessary to fit the punch plates *F* to their contour. It was necessary to locate the punches very carefully to avoid peening.

Part V of *Die Design and Die Making* will appear in an early number.

Chrysler Corporation Number

• The number appearing two weeks hence will be devoted entirely to the Chrysler Corporation, its policies of management, its production practices and its other far-flung activities. The purpose is twofold:

1. To present a cross-section of the automotive industry which has lead business in its recovery from the depression;

2. To give a complete picture of one manufacturing concern's operations from top to bottom.

• The editors trust you will find the Chrysler Corporation Number interesting and informative.

Editorials

AMERICAN MACHINIST ESTABLISHED 1877
VOLUME 80 NUMBER 10
K. H. CONDIT • F. H. COLVIN
EDITORS

THE MYSTERY TAX

AS DRAFTED by the House Committee on Ways and Means (without minority assistance) the Revenue Act of 1936 is quite the most mystifying document sponsored by the New Deal. The committeemen who passed it don't understand it, the Democrats in the House who voted for it don't pretend to know what it is all about, administration officials have been delightfully vague on its meaning.

Corporation treasurers have taken one good look at the House bill, and then, with an anguished moan, have reached for the telephone to call their tax specialists. But little good has that done them. The specialists are as mystified as the rest of us. One of them says, "The mystic maze of involved calculations condemns the scheme as unworkable in its present form."

Another one quotes Alice in "Through the Looking Glass." "It seems very pretty," she said, when she had finished it, (the Jabberwocky poem) "but it's rather hard to understand." (You see she didn't like to confess, even to herself, that she couldn't make it out at all.) "Somehow it seems to fill my head with ideas—only I don't know exactly what they are."

There you have it in brief. The promise of Mr. Roosevelt when he conducted his campaign by quoting "Alice" has been fulfilled in a way that none of us even dreamed. Which of those who enjoyed his witty baiting of his overserious adversary expected that the tone of his whole administration was being set then? Yet that was evidently the case.

Ill-considered, unworkable bills have followed one another in bewildering succession. The Supreme Court has dealt with the worst ones. If the Senate does not perform a miracle on this tax bill, the Court will probably have to perform an autopsy.

Aside from its unworkable provisions the tax bill is a pitiful thing because of its threat to do the exact opposite of what is intended. It will strengthen the intrenched position of the powerful corporation with adequate reserves, at the expense of the smaller units, some of them just starting, others just recovering from the wounds of the depression.

Since powerful corporations with big reserves are scarce in the machinery industry, which is essentially an industry of small units built around the genius of an individual or of a small group, the industry faces in this tax bill a threat to its very existence. It must take what steps it can to protect itself.

ANY ONE in the industry whose senator is still living in the world of reality, and not behind the looking glass, should get him on the telephone and tell him how this tax bill will hurt business.

Business Acts

BUSINESS LEADERS are to be congratulated for the steps they plan to take to stimulate re-employment. Industry has already done a mighty job in taking back over five million workers. It needs to take on less than two million more to get back to the 1929 level. Distribution of employment is not uniform, of course. Some divisions are above the 1929 peak now, others are below it.

Such being the case the first thing to be done is to find out where more men can be used. John W. O'Leary, president of MAPI, told the Washington meeting of the Chamber of Commerce of the U. S. that local chambers of commerce, trade associations, and individual merchants, manufacturers and professional men could cooperate to give a quick and accurate report on the unemployment situation. With this information available the total can be broken down into segments small enough to be handled intelligently and successfully.

Secretary of Commerce Roper urged the same step in his remarks, saying that a business survey would get the facts so much more quickly than a federal census that it should be done first. We cannot resist remarking that Mr. Roper is quite correct in view of the obvious disinclination of the administration to make any effort whatever to enumerate unemployment.

There is also a fair chance that business leaders will ask the labor people to cooperate in an employment study. If government, business and labor can get together on the job of ascertaining the facts there is more reason to hope for a successful attack on unemployment than has existed heretofore. Again we congratulate business leaders on taking the initiative.

Chips

WASHINGTON— President announces end of "breathing spell" for business and renewal of drive for high prices and high wages . . . On top of $700,000,000 tax bill and billion and a half relief appropriation Roosevelt asks Congress for $460,000,000 for social security . . . Administration measure to free Puerto Rico is introduced in Senate . . . G.A.R. magazine opens campaign for pensions for World War veterans as a "right" . . . Green urges nonpartisan policy on A. F. of L. in contrast to efforts of Lewis and Berry to deliver labor vote to Roosevelt . . . House passes tax measure practically unaltered . . . Approves resolution authorizing investigation of federal expenditures.

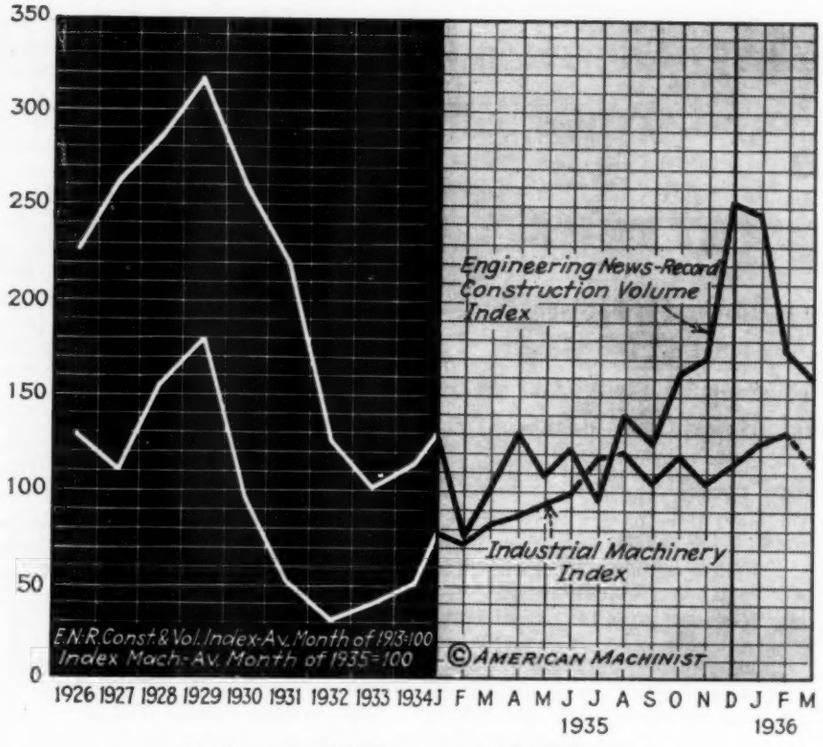
FOREIGN— Defense program forces British income taxes up . . . Social classes and private production are no more in Soviet Russia . . . Germany opens three schools to train future leaders, frees imprisoned critics of Nazi régime, plans to send more German students abroad to spread Nazi views . . . Schacht asks dictatorial power to control German finance, Goering gets the job . . . New system of courts set up to govern employers and employees under German Labor Front . . . Poland embargoes gold and exchange . . . Austria masses troops near German frontier . . . Hungary arrests 90 Nazis charged with inciting revolt.

FINANCE— Stocks drop severely on strength of Roosevelt speech and foreign situation coupled with weak technical position . . . Treasury boosts weekly sale of bills by $50,000,000 to cover bonus payments . . . Landis says SEC regulation will be more severe . . . Morgenthau tells Senate committee that deficit for next fiscal year will reach close to six billions and that revenue measure sent up by House will be more than $300,000,000 short.

INDUSTRY— Both employment and payrolls rose in March . . . Eastern railroads decide to accept ICC passenger fare cut ruling . . . C. & O. inquires for $11,000,000 worth of freight cars of various types . . . Pere Marquette asks bids on 500 automobile cars . . . Greenfield Tap & Die buys J. M. Carpenter branch of Whitman & Barnes to get Detroit plant . . . Merger of Allegheny and West Leechburg steel companies proposed . . . Supreme Court decides that International Business Machines cannot force renters of its equipment to use paper and cards made by IBM . . . General Motors reports best first quarter since 1929.

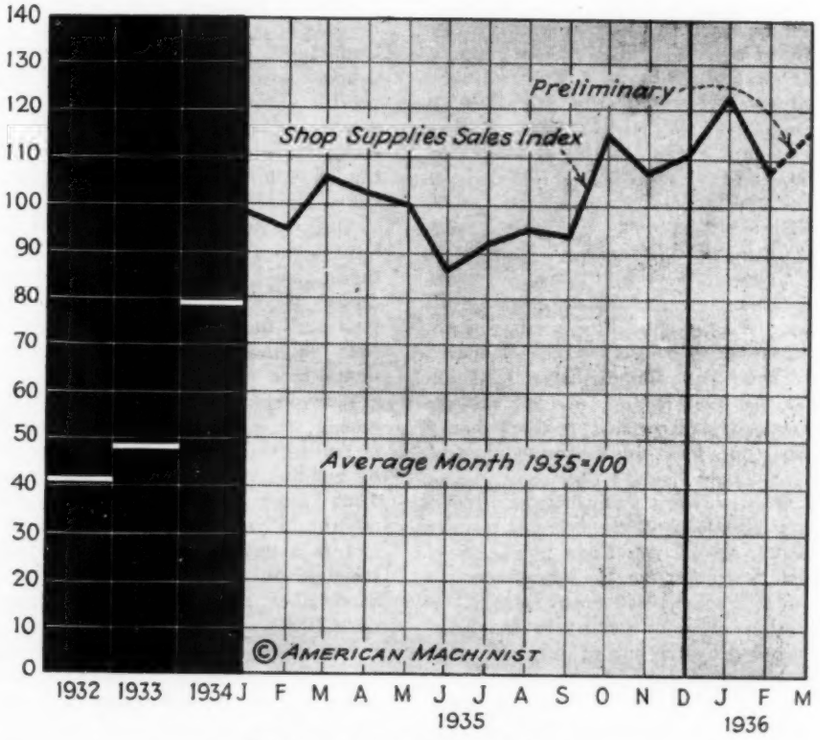
TRADE—March saw large gain in foreign trade . . . Scouts of Japanese firms busy mapping Chinese province of Chahar . . . Reciprocal trade treaty with France almost ready for signing, will keep France from our trade blacklist . . . Modest advertisement announces transatlantic sailings of dirigible Hindenburg and passenger fare of $400 one way . . . Roper orders inquiry into safety of American ships.

INDICATORS— Steel production passes 70 per cent mark on way up . . . Electric power output recovers counterseasonally after drop a week ago . . . *Business Week's* index recedes slightly to 71.5.



Orders for Industrial Machinery

Three factors missing when February's preliminary figure was computed brought it up from 120 to 130. March may act similarly



Sales of Shop Supplies

February's final figure differed little from the preliminary calculation. March shows a substantial improvement

March Index Figures Contradictory

While the March preliminary figure for the Industrial Machinery index sends the curve downward, it may be remembered that the same thing happened last month. The preliminary figure was raised 10 points when the correction for the late factors was made. It is quite possible, of course, that the same thing may happen this time.

The Shop Supply index, on the other hand, is little affected by the one late factor, as a rule. It turned upward strongly in March and is likely to hold that gain when the final calculation is made.

For purposes of comparison, this month, the Construction and Volume index of *Engineering News-Record* is plotted against the Industrial Machinery index. Here, it should be observed, the two curves are on different bases, one the monthly average for 1913, the other the monthly average for 1935. The interesting thing about these two curves is the closeness with which they parallel each other up to 1935. Incidentally, if the average figures for 1935 were shown, instead of the actual monthly figures, the correlation would still be close. This is rather interesting because of the supposed greater effect of government interference on construction activity than on equipment manufacture.

Deans Named By Three Engineering Colleges

Cornell, Yale and New York Universities Announce New Heads of Departments

Three important promotions in leading engineering colleges were announced last week by Cornell, Yale, and New York University.

Professor HERMAN DIEDERICHS, director, Sibley School of Mechanical Engineering, and John Edson Sweet professor of engineering, was elected dean of the College of Engineering, Cornell University, to succeed Dean DEXTER S. KIMBALL, retiring, June 1.

Professor SAMUEL W. DUDLEY, Strathcona professor of mechanical engineering, Yale University was appointed dean of the Yale School of Mechanical Engineering, succeeding Dean ROBERT E. DOHERTY, recently elected president of Carnegie Institute of Technology.

Professor THORNDIKE SAVILLE, for the past year associate dean, was named dean of the college of engineering, New York University, succeeding Dean COLLINS PECHIN BLISS.

Motors AND OTHER MATTERS

Detroit's rumor output high as all eye Ford . . New, smaller cars, not price cuts, expected . . . Diesels in the spot light . . . Chevrolet heavy machine purchaser . . . Public considered final arbiter of car design

BURNHAM FINNEY
Western Editor

DETROIT—With the start of 1937 automobile production not so far away, Detroit's rumor factories, as well as its motor car plants, are operating 24 hours a day. Stories range from those regarding cars with bodies built along the lines of an airplane fuselage, to those about the possibilities of a new small car capable of running 30 miles on a gallon of gas. What the industry is wondering, above everything else, is what Ford intends to do next year to try to regain the leadership which it has surrendered to Chevrolet.

Chances of a price cut on the present V-eight Ford seem remote. Heretofore when Ford was being outdistanced by a competitor, it has not resorted to lower prices and there is no reason to believe that it will do so now. Ford has available for use in this country the small V-eight engine developed at Dearborn and recently introduced in the French car produced in conjunction with Mathis. Those who have seen this motor in action are enthusiastic about it. Because of slowness in setting up production machinery abroad, it is understood that as many as 50,000 of these motors will be machined at Rouge.

Watching Ford

There is no secret about the fact that Chevrolet and Plymouth are watching Ford closely for any possible move to introduce a car powered by the small V-eight motor in the United States. Chevrolet is said to have gone so far as to develop a light motor with cast crank-shaft and camshaft to slip into a new small car to compete with a small Ford.

These plans are under cover and may never reach the public. A major difficulty arising from an invasion of the lower price market is the effect it would have on the sale of used cars, the problem child of the industry. They will be a bigger headache than ever if new small cars are sold at considerably lower prices.

Ford is now reported in the midst of buying further machinery for the machining of the small French V-eight engine at the Rouge plant.

Diesel engines for automotive use are receiving more attention. It is significant that General Motors has just established an experimental diesel department in Detroit which is housed in the Cadillac factory.

Chevrolet has been an outstanding buyer of equipment in recent months. It is known to have spent around $1,080,000 on the piston job alone. It probably will start 1937 with an alloy cast iron piston, shifting later to cast steel. The report that Chervolet will go to a modified L-type engine is ill-founded. It intends to continue with a valve-in-head motor, with some changes in the cylinder head and substitution of a four-bearing crankshaft for the present three-bearing shaft. Chevrolet is conservatively estimated to have spent four to five million dollars for 1937 changes and for enlargement of plant capacity. Much money has gone for transmission equipment at Saginaw.

Both Packard and Chrysler's Jefferson Avenue plant are believed to have about cleaned up their purchases of new machinery for the six-cylinder engines. Packard will begin getting this equipment in its factory in June, and installed by the end of July. Chrysler is aiming at July 15. Surface broaching is reported due for some new developments in machining the cylinder block at Packard and Chrysler.

At least two large car manufacturers are working on plans for making the Lincoln-Zephyr type of body at low enough cost for the lower price automobiles next year. Because of the great amount of welding on this body, the expense thus far has been high. The problem is partly one of perfecting faster and more economical welding processes. Incidentally, welding is steadily assuming increased importance in car production and will loom even larger as the industry turns to constantly wider steel sheets. With Fisher Body preparing to switch over to practically all-steel bodies next year, virtually all the industry will have been converted to steel body construction by 1937.

Independent wheel suspension probably will not gain new adherents next year. One important company discussed a return to coil springs, but upon examining the cost decided that such action would make a sizable dent in its profits. It will stick to conventional springing for another year.

Die Shops Busy

Die work is coming out in growing volume. Fisher Body is still letting jobs to shops around Detroit. Chrysler divisions have quotations out on considerable business and have contracted for fender dies. Chevrolet, Buick and Packard have awarded die work, while Hudson hasn't acted on its requirements.

Tooling programs now under way indicate that there will be few car introductions before October. Current demand is so extraordinarily good and prospects for sales in the next few months so bright that factories will be inclined toward continuing production of 1936 models as long as the market will take them.

April assemblies are estimated to have topped the 500,000 mark, and there should be little if any letdown during May. Car makers continue to prod steel mills and parts suppliers to rush shipments of materials. June should be a 400,000-car month.

Chevrolet is leading the industry, having set a new all-time sales mark in April. Oldsmobile smashed records by building 25,000 cars last month, or 5,000 more than in any previous month. Plymouth is making 3,300 motors a day and will maintain that schedule up to June 1. Hudson and Studebaker are touching new highs since 1929.

No volume producer appears willing to risk a rear-engine car in 1937. The industry can't go any faster in design changes than the public will let it, according to President McCuen of Oldsmobile, and manufacturers are bowing to that fact. But 1938 assuredly will see rear-engine cars in production.

Employer-Employee Cooperation Urged At National Metal Trades Convention

New N.M.T.A. President

CHARLES H. STRAWBRIDGE

Focusing its attention upon employer-employee cooperation, the 38th annual convention of the National Metal Trades Association closed its two-day session in New York April 23 with a near-record attendance of more than 300 executives.

Details of a carefully devised plan of education of executives were placed before the meeting by the National Committee on Employer-Employee Cooperation, consisting of J. S. Knowlson, chairman of the board, Stewart-Warner Corp.; Howard W. Dunbar, manager, Grinding Machine Division, Norton Co.; Louis Ruthenburg, president, Servel, Inc.; and Henry W. Johnson, vice-president, DeLaval Steam Turbine Co., chairman. There was some uncomfortable moving about in chairs as Mr. Knowlson fired such questions as these at his hearers: How high is the IQ of management? Would it dare take an intelligence test in competition with its employees?

Mr. Dunbar outlined a plan of regional meetings and local group meetings of NMTA member executives to study the question of better industrial relations and learn how to apply the best methods that have so far been developed. He maintained that management has a dual responsibility, and that it must discharge its responsibility to employees as faithfully as to the company. The speaker also emphasized the key position of the foreman.

Mr. Ruthenburg described several case histories of industrial cooperation to show that each one must be handled on its merits. Mr. Johnson answered questions on the program and explained what would be covered in the nine bulletins that are to be issued by his committee.

Merle Thorpe, editor, *The Nation's Business,* was the dinner speaker. His subject was "The State of the Union." John H. Van Deventer, editor, *The Iron Age,* took a look into the future of the metal trades and found it promising. Albert Linton, president, Provident Mutual Life Insurance Co., discussed the Social Security Act and some of its consequences. He believes that it would be better to use the fund accumulated to retire the national debt and to meet the needs of security by taxes rather than to try to handle the $47,000,000,000 fund that is envisioned as the maximum.

N.M.T.A. Vice-President

NELSON W. PICKERING

A vigorous defense of the machine and industrial civilization was made by Dr. James S. Thomas, president, Clarkson College of Technology. He pointed out that cultural civilization is impossible without an industrial or materialistic civilization to supply the wherewithal. He asserted roundly that the machine does not put men out of work, that it does not undermine health, that it has not caused overproduction, and that it has done more to rid the world of slavery than all the preaching man has ever done.

Never have the metal-working industries been in such need of skilled workers as today, George A. Seyler, works manager, Lunkenheimer Co., Cincinnati, told the convention. As chairman of the Association's industrial educational committee, he urged executives charged with apprentice and foreman training to concentrate all attention possible on selecting young men for matriculation into the work on the basis of their natural aptitudes in working with machinery.

John Gall, associate counsel, National Association of Manufacturers, told the members that the present tactics of the Administration clearly indicated that the legislative program is to effect in piecemeal control of industries by federal bureaus, just as the N.R.A. had attempted to control all industries.

He charged that the Guffey Act, Wagner Act, Healy-Walsh bill and the Ellenbogen bill were the Administration's first steps in this direction, and if the principles involved were sustained by the Supreme Court, industry would be hampered until the acts could be repealed. Control, he predicted, would be applied through powers of taxation, licensing and federal loans, and administered by federal bureaus.

Charles H. Strawbridge, Goodman Mfg. Co., was elected president of the National Metal Trades Association, to succeed Alexander Sellers, president, William Sellers & Co., Inc., Philadelphia

N. W. Pickering, Farrel-Birmingham Co., Ansonia, Conn., was elected first vice-president; A. H. Timmerman, Wagner Electric Co., St. Louis, was elected second vice-president, and Harold C. Smith, Illinois Tool Works, Chicago, was elected treasurer.

Councillors elected were Mr. Sellers; R. W. Gillispie, Jeffrey Mfg. Co., Columbus; George A. Seyler, Lunkenheimer Co., Cincinnati; Harold S. Falk, Falk Corp., Milwaukee; D. F. O'Brien, A. P. Smith Mfg. Co., East Orange, N. J., and Louis Ruthenburg, Servel, Inc., Evansville, Ind.

Elected N.M.T.A. Treasurer

HAROLD C. SMITH

Watching Washington

Old principles take the count . . . Efficiency and frugality are staggered by President and Congress . . . House passes big navy bill . . . Security does not apply to the pocket book

WASHINGTON—Accepted economic beliefs have been pretty well pummeled in the last two or three years, but it remained for the President himself to take a healthy swing at the old idea that industrial efficiency contributes to general well being. At the Jefferson Day dinner in New York on April 25, he stated flatly that, "Reduction of costs of manufacture does not mean more purchasing power and more goods consumed. It means just the opposite."

According to this, it is only an illusion that the efforts of automobile manufacturers to pass cost savings on to consumers has made it possible for more people to own cars; or that mechanical refrigerators and other household appliances are so widely distributed because of production economies. Yet, the President has repeatedly stressed the need of lower cost housing to extend home ownership and raise living standards. If reduced prices are desirable for building construction, why not for manufactured goods?

Drastic Provisions Passed

Another old saw, that about saving for a rainy day, received a jolt from the House when it passed verbatim the tax bill handed to it by the Administration. According to David Cushman Coyle, the bill's author, saving for a rainy day just makes it rain harder. Not that all assenting House members really swallow this theory, but they know "orders is orders" nowadays. In addition to soak-the-surplus provisions, the bill includes drastic clauses as to the payment of dividends by one corporation to another—a direct poke at holding companies.

The Senate has made a start on rewriting the tax bill and unscrambling some of its more cryptic passages, but there is no indication that it will be made less severe. At the present writing, many Senators seem to be ready to approve the undivided profits tax provisions and to yield to Secretary Morgenthau's plea for increased revenue.

While the full force of the tax measure will not be felt until after election, the current end of the "breathing spell" indicates a feeling of confidence in official quarters. No peace is offered to industry; in fact there are repeated hints of renewed attempts to regulate wages and hours. Apparently the party in power considers itself secure with its backing of forgotten men, WPA workers, relief rollers and other recipients of federal bounty.

Spending it Already

No sooner had the House passed this tax bill than it started to spend the proceeds of the next one (prospective receipts of present bill are already expended). Its Appropriation Committee, reporting the largest peacetime Navy Bill in history, called for an outlay of over $500,000,000. In putting its O.K. on this measure, the House provided for two new battleships, twelve destroyers, six submarines and 33 airplanes. Increases in personnel are also called for. Contained in the bill is a strict limitation on government aircraft construction, which bans the building of engines other than experimental types and restricts building of planes to those for primary training.

First installment of the security program was set at $460,000,000 by the President. This sum includes deficiency appropriations for the Social Security Board and an outlay of $265,000,000 for the Old Age Reserve Account. If experience parallels that in many other countries this request foreshadows repeated demands which in the past have often proved a strain on national credit.

What may prove to have a far-reaching effect on New Deal policies is the decision of Chief Justice Hughes and four of his associates that the Supreme Court has the right and duty to review findings of facts made by an administrative or quasi-judicial agency when a constitutional right is concerned. Dissenting, Justices Brandeis, Stone and Cardozo, contended that the Court's power is limited to determining whether proper procedure had been followed. So many powers have been centralized in agencies, such as the Labor Board, that the decision to examine questions of fact may alter the complexion of cases brought before the Court.

N.M.T.B.A. SPEAKER

Glenn Frank Scheduled as Dinner Speaker at Chicago

Dr. Glenn Frank, president, University of Wisconsin, will address the Spring Meeting dinner of the National Machine Tool Builders' Association, May 11, Edgewater Beach Hotel, Chicago. The meeting begins Monday and closes Tuesday.

CABIN TRAILERS

Traveling Cabin Co., Formed in Bridgeport, Buys Briggs Factory

Traveling Cabin Corp., Bridgeport, Conn., was recently organized by William J. Seelinger, president, and associates, to manufacture cabin trailers for automobiles. The company has bought a factory at 587 Hollister Ave., formerly owned by Briggs Body Co., Detroit.

AIR-COOLED ENGINES

Doman-Marks Opens Factory in Syracuse to Build Industrial Engines

Doman-Marks Engine Co., industrial and truck air-cooled engine manufacturers, has opened its factory in Syracuse, N. Y., E. S. Marks, president, said. Mr. Marks was formerly chief engineer of the Franklin automobile works.

WINCHESTER EXPANDS

Arms Company Buys Flashlight Business from Bond Electric

Winchester Repeating Arms Co., New Haven, Conn., has purchased the flashlight and battery business of Bond Electric Corp., Jersey City, N. J. Manufacturing equipment will be moved to New Haven.

U. S. Chamber Hits Tax Bill, Social Laws; To Study Unemployment

Authorizing a survey of industry's capacity to absorb more labor, the Chamber of Commerce of the United States closed its 24th annual meeting May 30 with an attack on the federal tax bill, social security act and other New Deal legislation which it believes to be an invasion of private rights.

Although many speakers resented President Roosevelt's recent challenge to industry to put the unemployed back to work, the meeting as a whole showed a milder tone than last year's gathering of the foremost business and industrial leaders of the nation.

The round-table session on increasing employment was one of the outstanding features of the session. The keynote was that more work could be had for those willing to work by increasing consumption. Industry's method to accomplish this, leaders in this discussion showed, was to develop new techniques and new products, to increase sales effort and, through volume production, to pass savings on to the consumers.

Pitfalls were said to be limiting hours and hindering the use of labor-saving machinery.

Secretary of Commerce Roper, who spoke to the Chamber for the first time in three years, asserted that prompt action by business to maintain proper wages and hours will take bureaucracy out of government. A survey by business of its own employment needs was suggested by Mr. Roper, but anticipated by the chamber, and observers agreed that the A. F. of L. would probably cooperate.

Studies proposed by John W. O'Leary, president, Machinery & Allied Products Institute and those suggested by Mr. Roper were in the main similar. They included:

Comprehensive study of technological unemployment and methods for speeding up transfers of replaced workers to other fields; Replacing obsolete and depreciated machinery to stimulate the durable goods industry; develop privately-financed home building programs and aggressively bid for more foreign trade.

Secretary Roper urged every possible use of cooperation between business and government, and suggested that industrial and business leaders encourage states and local communities to reassume their responsibility for social problems as soon as possible.

Harper Sibley, Rochester, N. Y., banker, was re-elected president, and other officers were re-elected.

N.M.T.B.A. Awarded

The National Machine Tool Builders Association was given the 1933-'35 American Trade Association Executives Award in recognition of its service to its own and other industries. The National Tool Show, Cleveland, was cited by Secretary of Commerce Roper, as the association's "outstanding achievement," in making the presentation April 28 to Herman H. Lind, N.M.T.B.A. general manager, in Washington, D. C.

EMPLOYMENT UP

Continued Increases Reported By 51 Major Manufacturing Concerns

Fifty-one major Toledo plants, chiefly automotive, reported 18,748 workers in the week ended April 18, a gain of 175 over last week, and compared with 18,441 a year ago. The majority of auto parts plants are operating at capacity, or near capacity.

Gains in employment have been reported in eleven of the last twelve weeks.

REED-PRENTICE WILL MAKE DeVLIEG MILLING MACHINES

Reed-Prentice Corp., Worcester, Mass., has arranged with the DeVlieg Milling Machine Co., Curtis Bldg., Detroit, Mich., to manufacture the DeVlieg milling machines. This corrects the statement on p. 344j, April 22 issue.

Industrial Review

• LEADING industrial centers of the country report satisfactory sales of machine tools and machinery during April and good prospects for continuance at this level during May. In two or three instances the story is that sales would have been higher if it had been possible to make deliveries.

• FROM BOSTON comes word that April business in New England was very good, that inquiries are coming in in considerable numbers and that there is a reasonable expectation of closing an appreciable number of them. Philadelphia says that April sales were at about the March level, which was moderately good. In this territory several important buying programs are under consideration and will mean considerable business if they are placed. In the Metropolitan district sales reached levels comparable with those of 1929, and there are plenty of inquiries for salesmen to work on. Distributors there are optimistic.

• PITTSBURGH found April business well ahead of that of March partly because of flood conditions. After three comparatively quiet weeks in Cleveland there has been a decided upturn in machinery business. Machine tool companies in Cleveland are decidedly active and the outlook is most promising. Orders for machine tools in Detroit come in fits and starts. A considerable amount of business is pending, but prospective customers seem to be waiting to see what will happen politically. Demand for small tools and supplies is definitely on the increase.

• THE SITUATION IN TOLEDO is still encouraging although the number of actual orders is less than it was some weeks ago. In Indianapolis business is proceeding on what is considered to be a normal basis. Inquiries are fair, and the proportion of inquiries is about what should be expected. April was an extremely satisfactory month in Cincinnati. If May is as good everybody will be happy.

• IN ST. LOUIS April business is quite up to the average of recent months and probably somewhat ahead. There has not been any very great variation in demand from month to month. April was a banner month in Chicago for some distributors at least. The volume of business compared with the larger months of 1929. At the moment the outlook for May is not quite as encouraging as the outlook for April was a month ago. Vigorous competition made business harder to get in the Milwaukee territory but on the whole the level is a reasonably satisfactory one.

Heads Tool Engineers

FORD LAMB

CHINA BUYS MORE TOOLS

U. S. Machinery Manufacturers Rank Fourth With $3,000,000 Sales

China imported 19 per cent more industrial machinery in 1935 than in 1934, in face of a decline of 4 per cent in the country's aggregate import. Of a total value of $20,485,000 in U. S. currency, United States manufacturers shipped nearly $3,000,000 worth.

FORD LAMB, Detroit district manager, Consolidated Machine Tool Corp. of America, Rochester, N. Y., has been elected president of the American Society of Tool Engineers, Detroit (*AM*—Vol. 80, page 344c). FRANK SHULER, master mechanic, Chrysler Corp. Highland plant, and LUKE BEACH, Packard Motor Car Co., are 1st and 2nd vice-presidents; RAY BRUNNER, Dodge Bros. Corp., was elected secretary, and FRANK CRONE, Lincoln division, Ford Motor Co., was elected treasurer.

STAMPING FIRM ELECTS

Founder Named Chairman, Second Generation Executives Elected

F. J. FREY, a founder of Geuder, Paeschke & Frey Co., 1425 West St. Paul Ave., Milwaukee, Wis., pioneer metal stamping firm, was elected to the new post of chairman of the board. CHARLES PAESCHKE, JR., formerly vice-president and secretary, was named president. Other officers elected were FRANK FREY, JR., executive vice-president and treasurer; HENRY V. MILLMANN, vice-president in charge of production; CARL H. VOSS, vice-president, sales, and JOHN F. HARMON, secretary. A. J. CHAMBERLAIN was appointed manager of the steel package division.

Elected Vice-President

FRANK SHULER

New 2nd Vice-President

Lee F. Redman photo

LUKE BEACH

MERGER APPROVED

Automotive Companies' Stockholders Approve Jacobs-Metalcraft Plan

F. L. Jacobs Co., Detroit, automotive parts manufacturers, and Grand Rapids Metalcraft Corp. stockholders have approved the merger of the two companies, under the corporate name of the former. Wallace Hook, former president of Metalcraft, has been elected vice-president of the F. L. Jacobs Co., in charge of the Metalcraft division at Grand Rapids.

J. G. BRILL PROMOTIONS

CHARLES O. GUERNSEY, formerly vice-president and chief engineer of J. G. Brill Co., Philadelphia, street car, bus and rail car manufacturers, has been elected vice-president in charge of engineering, sales and service. L. M. DE TURK takes charge of the mechanical engineering department.

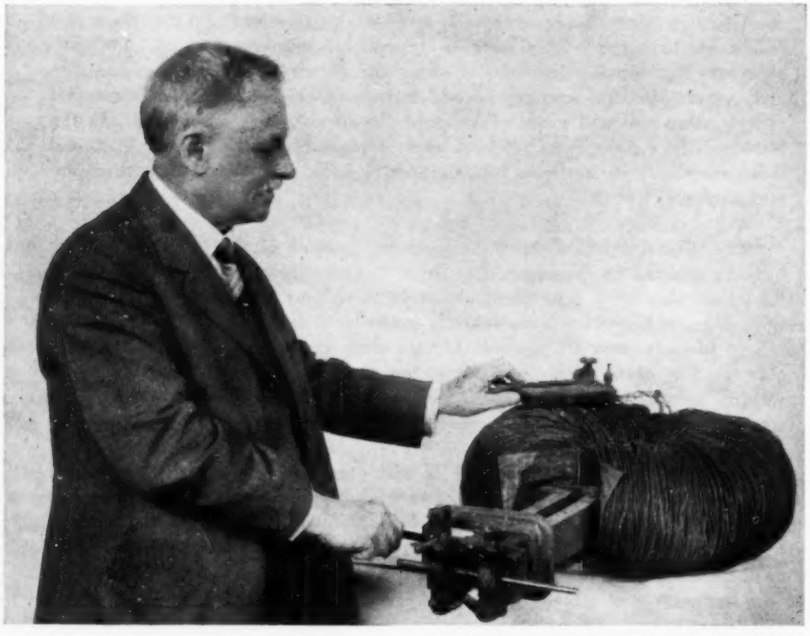


Photo courtesy of General Electric Co.

It Blazed New Trails—"I have called the process 'electric welding'," Prof. Elihu Thompson told the Boston Society of Arts one evening 50 years ago, in making his simply-stated announcement of a development that was to revolutionize metal working. His first apparatus, with a single-turn secondary transformer, shown above, was first described in *Electrical World*, Dec. 25, 1886. "Its future is a very bright one," wrote the editor of the magazine, now a McGraw-Hill publication

E. S. Sawtelle Elected to Head Gear Makers; G. L. Markland Is Host

PHILADELPHIA — Appropriately, as one of the old timers who founded the American Gear Manufacturers Association, at Lakewood, N. J., just twenty years ago, George L. Markland, Jr., chairman of the board, Philadelphia Gear Works, and president, Philadelphia Board of Trade, welcomed A.G.M.A. members to their annual spring meeting at the Hotel Adelphia, April 20–21. With attendance at a peak, the program prepared by B. F. Waterman, Brown & Sharpe Mfg. Co., was carried through business and technical sessions with lively interest.

Among visitors who addressed the meeting, John W. O'Leary, president, Machinery and Allied Products Institute and Frederick B. Heitkamp, of the American Type Founders Co., received particular attention. Mr. O'Leary, in discussing the growing importance in relations between business and government, pointed out that it is essential to keep before the voting public its dependence on industrial prosperity. Speaking on sales, Mr. Heitkamp emphasized the need for greater effort in market analysis and promotional activities.

Another visitor, back for a return engagement, having addressed the A.G.M.A. in 1933, was Everett Chapman, vice-president, Lukenweld, Inc. He spoke on "Cast Steel and Welded Plate Combination Gear Housings," showing by means of slides a series of applications. S. M. Weckstein, chief engineer, Timken Roller Bearing Co., using the same method of demonstration, gave design details for the application of roller bearings to reduction units.

Cost Factors

Factors affecting gear cost estimating were outlined by G. Russell Holbrook, Charles E. Crofoot Gear Corp. He spoke of the necessity of including all tool costs and other related charges. "Gear Noise—Causes and Corrections" was presented by W. E. Sykes, Farrel-Birmingham Co. This speaker analyzed the causes of noise and the means available for keeping it within bounds.

"Marine Gearing," subject of a paper by Ira Short, South Philadelphia Works, Westinghouse Electric & Mfg. Co., traced developments in this field. Mr. Short also used slides, showing means of cutting, testing and mounting. G. E. Katzenmeyer, National Erie Corp., explained a method of measuring gear capacities by means of tables and graphs based on the Lewis formula.

In his address, "Hobs and Hobbing," S. M. Ransome, Barber-Colman Co., told of strides made in the accuracy of this method of gear cutting. He discussed ways of hob grinding, mounting and inspection to assure close adherence to tolerances. Donald Graham Clark, of the Brown & Sharpe Mfg. Co., described "A Purchasing Agent's View of the Gear Salesman."

The annual dinner celebrated "Past Presidents' and Old Timers' Nite." A. A. Ross, General Electric Co., retiring A.G.M.A. president, introduced Mr. Markland, who was toastmaster. He, in turn, presented Charles H. Crakelow, the speaker of the evening. After an entertainment arranged by Louis B. Bond, local chairman of the entertainment committee, many of the old timers of the Association spoke.

New A.G.M.A. Officers

President
E. S. Sawtelle
Vice-president,
Tool Steel Gear & Pinion Co.

Vice-President
H. H. Kerr
President, Boston Gear Works

Treasurer
J. Harper Jackson
Pittsburgh Gear & Machine Co.

Manager-Secretary
J. C. McQuiston

New Members of Executive Committee

F. H. Fowler
Foote Bros. Gear & Machine Co.

J. H. Flagg
Watson Flagg Machine Co.

Charles Goedke
Granschow Gear Co.

W. D. Jones
President,
W. A. Jones Foundry & Machine Co.

A.G.M.A. Vice-President

H. H. KERR

Heads Gear Makers

E. S. SAWTELLE

INCREASES CAPACITY

Buick Forge and Heat-Treating Facilities Are Being Increased

Buick Motor Co., Flint, Mich., is increasing the capacity of its forge plant. New heat-treating equipment will be installed in a new building, construction of which will begin soon.

BUYS PLANT

Tap and Die Company Acquires Carpenter Concern in Detroit

Greenfield Tap & Die Corp., has acquired the J. M. Carpenter Tap & Die Co., a subsidiary of Whitman & Barnes Corp., Detroit, Mich., giving the Greenfield company a plant in the automotive center. Greenfield will expand its line.

KODAK EXPANDING

Increased Manufacturing Facilities Being Built at Rochester

Eastman Kodak Co., Rochester, N. Y., announces a $1,115,000 building expansion program, consisting of two additions to the Kodak Park plant and one to the Hawkeye camera works.

Large Attendances Hear Wide Range of Production Topics at S.A.E. Meeting

Development of cast crankshafts and camshafts, the increasing part played by balancing in the production of motor cars, progress made by cemented carbide tools, the manufacture of elliptical skirted pistons and tooling of the Packard 120 cylinder block line were among the topics discussed at the production meeting of the Society of Automotive Engineers, Detroit, April 21 to 24.

Distinguished by the wealth of detail contained in the various papers, the meetings had large attendances. A number of plant visits was a feature, with technical sessions held in connection with some of the trips. A high spot was a tour of Greenfield village and the Ford industrial museum at Dearborn and of the foundry and glass works at Ford's Rouge plant. C. L. McCuen, president, Oldsmobile Division, General Motors, spoke at the production dinner, April 23.

Explains Ford's Methods

W. F. Pioch, Ford Motor Co., described the casting and machining of the Ford V-eight crankshaft, detailing not only the operations in sequence, but also the cutting speeds, feeds and tools used. He pointed out that 5½ pounds less of metal is removed in machining the cast alloy steel crankshafts, compared with the forged shaft. Five minutes is saved in machining, 15 minutes in grinding and ½ minute in balancing the cast shaft as against the forged type. Fatigue resistance of the cast shaft, he said, is double that of the forged shaft. After running a car 25,000 miles, bearings show no sign of wear.

D. J. Vail of the Campbell, Wyant & Cannon Foundry Co., outlined the development of "Proferall" (processed ferrous alloyed iron) cast camshafts which are now specified as standard equipment by a number of automobile companies. These camshafts resist wear equally well of tappets made of any material and tappets are less noisy than with forged camshafts. Pattern expense is much less than the cost of forging dies, and heat treatment is unnecessary. Changes in design of the cast shaft can be made without delay and at slight cost.

Urges Forging Research

In the discussion R. E. W. Harrison expressed regret that the same careful study given to development of cast shafts had not been concentrated on improvement of forgings. He attributed much of the excess weight in forged parts to the continued use of antiquated forging machinery, quoting the *American Machinist's* survey as to the excessive age of this type of equipment.

Advantages of cast crankshafts as compared with forged shafts from a manufacturing standpoint, declared Anker K. Antonsen, Fairbanks, Morse & Co., are that they retain their shape better, not distorting as the stock is removed, and because of its hardness, finished surfaces of cast material are not easily mutilated. It is difficult, however, to detect imperfections in cast shafts unless they are X-rayed. The largest cast crankshaft used by Fairbanks, Morse weighs 1,300 lb. in the rough and 1,050 lb., machined. It has eight throws with 8-inch journals and crankpins 6¾ inches in diameter. The minimum tensile strength is 52,000 lb.; hardness is from 269 to 325, Brinell.

Many large manufacturers with quantity production jobs have lately been buying single-purpose machines, particularly boring equipment, which can be used profitably only with cemented carbide tools, said J. P. Wells, Pontiac Motor Co. Hard carbide metals have increased production and cut tool costs because of faster cutting, longer tool life, greater accuracy, minimum distortion, combined cuts, no breaking away of edges, reduction in heat, and ability to machine harder materials. He said carbide tools today are being successfully applied to numerous steel jobs and that users will find it to their advantage to cooperate in developing new steel applications.

Grinds Carbide Faster

Mr. Wells brought out the fact that a Detroit supplier of cemented carbide tools has perfected a process for rapidly grinding its tools. Fast grinding is dependent on proper technique, careful selection of proper wheels, and proper machines.

Improvement in balancing has contributed much to smoothness of present-day cars, and makes it possible for one to drive 500 miles in a single day in a low-priced automobile, said S. T. Foresman of Chrysler Corp. The most difficult part of balancing is the elimination of the last half-inch ounce of unbalance in the part being balanced. The crankshaft is the most difficult part of the engine to balance. Today car makers are balancing wheels, tires and even brake drums, the discussion disclosed.

In a few years it will be economical to build a balanced machine entirely automatic in operation, even including the corrections of the part to be balanced, stated B. E. Ohlson, Tinius Olsen Testing Machine Co., in a paper on "Olsen Methods of Balancing," which described various types of balancing machines in use. Ewald J. Wolff and Lawrence F. Hope, General Motors research laboratories, told in detail about balancing machines of special design employed in G. M. plants.

R. N. Brown, Packard Motor Car Co., gave a detailed description of the tooling of the Packard 120 cylinder block line, which was done by the Ingersoll Milling Machine Co. This involved building 33 new machines and designing and making 323 standard tools and 1,037 special jigs, fixtures, gages, cutting tools and holders. The complete line was set up in the Ingersoll plant and tested on 400 blocks before being shipped to Detroit.

The method of casting elliptical skirted aluminum pistons and the various machining operations on them were described by E. S. Chapman, general works manager of Plymouth Motor Corp. J. L. McCloud read a paper by R. H. McCarroll of the Ford Motor Co. telling about the development of laminated safety glass and how Ford makes this product at the Rouge plant. Plants of the Aluminum Co. of America and of Great Lakes Steel Corp. were visited.

MAKING CARBURETORS

Kane Products Co. Leases Connecticut Plant, Starts Production

Kane Products Co., Long Island City, N. Y., has leased, with option to purchase, the Holmes Mfg. Co., plant, Shelton, Conn., for manufacturing carburetors and other automotive products. Chester A. Killmyer, formerly with Tillotson Mfg. Co., Toledo automotive parts manufacturer, is general manager in charge of production at the new plant.

YOUNG EXPANDS

Spring and Wire Company Buys Plant in Los Angeles

L. A. Young Spring & Wire Co. has purchased a new plant in Los Angeles, Calif., to supply requirements for Pacific Coast customers. The plant will be in operation soon.

Buick Chief Engineer

CHARLES A. CHAYNE

CHARLES A. CHAYNE has been appointed chief engineer of Buick Motor Co., Flint, Mich., succeeding F. A. BOWER, who has been given an indefinite leave of absence because of ill health. Mr. Chayne recently had been assistant chief engineer of Buick, and formerly was with Lycoming Mfg. Co., Williamsport, Pa., and Marmon Motor Car Co., Indianapolis, Ind.

PERSONALS

THOMAS I. SHRIVER, formerly manager of the Syracuse, N. Y., office of Henry Prentiss Co., has been elected president of the Y. & O. Press Co., Hudson, N. Y.

HERBERT N. WEST, chief engineer and works manager of the Weir Kilby Corp., Cincinnati, Ohio, has been elected vice-president of the company and will be in charge of the Cincinnati and Birmingham, Ala., plants of the concern, and will continue to head the engineering work.

LOUIS MALKOVSKY has been appointed factory superintendent of the Sperry Gyroscope Co., Inc., Brooklyn, N. Y., succeeding I. H. MILLS, who recently retired after many years with the company.

SIDNEY DIAMANT, president, Diamant Tool & Mfg. Co., Newark, N. J., has been elected president of the Hudson River Valley Division of the Special Tool, Die & Machine Shop Institute, Inc. FRED C. DANNEMAN, president, F. C. Danneman Co., New York, was elected vice-president, and B. B. BECK, Mechanical Tool & Die Co., was named secretary-treasurer.

ARTHUR J. SCAIFE, formerly transportation engineer, White Motor Co., Cleveland, Ohio, has joined Autocar Co., Ardmore, Pa., as research engineer, associated with B. B. BACHMAN, vice-president and chief engineer. Mr. Scaife joined White 36 years ago, starting as tool maker and successively became tester and experimental engineer. A past-president of the Society of Automotive Engineers, he is a member of numerous committees and serves on the U. S. Ordnance Advisory Committee.

ROBERT T. WOODINGS, assistant to the president, Woodings-Verona Tool Works, Verona, Pa., has been elected vice-president.

H. C. DIETRICH has been appointed general foreman of the New York Central shops, Chicago, Ill.

A. W. LELAND has been appointed works manager of the Rockford, Ill., plant of J. I. Case Co., Racine, Wis., succeeding the late BRADFORD BRINTON.

LYMAN H. CLARK has been appointed works manager of the Diebold Safe & Lock Co., succeeding George Lee Miller, resigned. Mr. Clark has been with the company for fifteen years, and was formerly assistant to the president, A. J. Roos.

Works Executive Retires

E. R. NORRIS

E. R. NORRIS, since 1930 assistant to the general works manager of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has retired after 44 years continuous service with the company. A recognized authority on machine tools and manufacturing equipment, he became director of works equipment soon after he was appointed to the staff of manager of works in 1904.

New Works Manager

HARRY J. KICHERER

HARRY J. KICHERER has been appointed works manager of the American Hoist & Derrick Co., St. Paul, Minn. He was formerly with the Caterpillar Tractor Co., Peoria, Ill., and had been with the Russell Grader Co., St. Paul. He has had twenty years' experience in manufacturing, and is a past chairman of the Northwest Chapter, American Society of Metals.

GEORGE W. BURRELL, president, Wellman Engineering Co., 7004 Central Ave., Cleveland, Ohio, has been elected president of the Cleveland Chamber of Commerce. L. R. SCAFE, general manager of the Fisher Body Co., was chosen vice-president.

CHARLES J. STILWELL, vice-president, Warner & Swasey Co., and FREDERICK C. CRAWFORD, president, Thompson Products, Inc., have been elected to the board of directors of the chamber.

CHARLES F. KETTERING, vice-president and research director, General Motors Corp., has been named a recipient of the John Scott Memorial Award for scientific achievement.

J. W. LEWIS, since 1923 assistant to GERARD SWOPE, president, General Electric Co., was elected a vice-president of the company, succeeding R. S. MURRAY who retired May 1.

A. C. SCHROEDER, production inspector in the car department of the Chicago, Milwaukee, St. Paul & Pacific Railroad, has been appointed general foreman of the freight car shop at Milwaukee, Wis.

F. W. BUNTING and HAROLD A. SCHLEIDER have been appointed inspection engineers of the Northern Equipment Co., Erie, Pa.

BUSINESS ITEMS

Sundstrand Machine Tool Co., Rockford, Ill., has appointed Livingstone-Burleigh, 7310 Woodward Ave., Detroit, Mich., exclusive dealers for Sunstrand and American Broach lines in the Detroit area. J. E. Livingstone has been connected with the American Broach & Machine Co., recently acquired by the Sundstrand company, ever since it was started, and D. B. Burleigh has been for many years sales manager and Detroit representative for the Sundstrand Machine Tool Co.

Carl Mayer Corp., 3030 Euclid Ave., Cleveland, Ohio, has been organized to manufacture a complete line of industrial ovens and drawing and tempering furnaces. Carl Mayer, president, was formerly with Smith-Mayer Corp., oven and furnace builders, dissolved. C. A. Vining is vice-president.

Torrington Co., Torrington, Conn., and Bantam Ball Bearing Co., South Bend, Ind., have appointed C. W. Dietrich, Jr., sales engineer for their swaging machines and ball and roller bearings with headquarters at 200 Fifth Ave., New York, N. Y. He was formerly with Automatic Refrigerating Co., Hyatt Roller Bearing Co., and James T. Gordon Co.

Sterling Grinding Wheel Co., Tiffin, Ohio, has opened a branch office and warehouse at 912 West Washington Blvd., Chicago, Ill., where the company's sales department for the Western division will be concentrated. Complete stock of abrasive products will be kept. Messrs. Bucheister and Lott are in charge of the branch.

Westinghouse Electric & Mfg Company has moved its New York executive and sales office to the Westinghouse Bldg., 150 Broadway, with the Westinghouse International Co., and the Westinghouse Lamp Co.

Allen-Bradley Co., Milwaukee, Wis., motor control equipment, has moved its New York office to larger quarters in the Underwood Bldg., 30 Vesey St., from 50 Church St., because of increase in business.

Cutler-Hammer, Inc., 12th and St. Paul Ave., Milwaukee, Wis., electrical control apparatus, has opened an office at 10 West Chase St., Baltimore, Md., to handle its Maryland and Virginia distribution. R. A. Haworth is manager.

V. O. Press Co., Hudson, N. Y., has appointed William K. Stamets, Rockefeller Bldg., Cleveland, Ohio, its Northern Ohio representative.

The Bristol Co., Waterbury, Conn., recording and control instruments, has appointed L. E. Mustard, Detroit district manager.

OBITUARIES

ERNEST BLUME, 77, for 25 years purchasing agent, Lidgerwood Mfg. Co., New York, died April 18.

STANLEY F. BOOTH, 83, a founder and treasurer of Moore Steam Turbine Co., Wellsville, N. Y., died April 19.

P. L. BRYANT, 55, president, Construction Machinery Co., Waterloo, Iowa, died recently there.

FRANK G. CHAMBERS, superintendent of Straight Line Engine Co., Syracuse, N. Y., died recently. He had been with the company for about 50 years.

PAUL EWALD, secretary-treasurer, Superior Wire Spring Corp., Cleveland, Ohio, died April 3.

FRANK S. HUNTER, 83, vice-president, F. M. Howell & Co., Elmira, N. Y., manufacturers of oil field machinery and equipment, died April 1.

CHARLES D. JENKS, president, Chicago-Cleveland Car Roofing Co., Chicago, Ill., died April 4.

FREDERICK C. KIRCHNER, 63, general manager, Youngstown Lamp Works, Youngstown, Ohio, died March 25. He developed special manufacturing equipment for his company, a subsidiary of the General Electric Co.

SAMUEL H. LOTT, 54, for ten years associate professor of machine design, Stevens Institute of Technology, Hoboken, N. J., died April 10.

WILLIAM C. MERWARTH, 65, shop superintendent of Pennsylvania Pump & Compressor Co., Easton, Pa., died April 24.

ROBERT R. MCKECHNIE, 73, designer of the first full-swing tractor steam shovel in this country for Thew Shovel Co., and for years with Variety Iron Works, Cleveland, Ohio, died April 18.

WILLIAM PETERS, 66, senior partner of James Peters & Sons, manufacturers of hardware, died April 12 in Philadelphia.

WILLIAM CHARLES PEYTON, 67, president, Standard Stoker Co., Erie, Pa., died April 4 in New York, N. Y. He was a machine designer of wide experience, and was known as the inventor of smokeless powder.

JAMES E. SCHALL, 77, general manager, New Haven Iron & Steel Works, Fair Haven, Conn., died April 4.

WILLIAM H. SPIRE, 56, formerly chief engineer and production manager of Thompson Products Co., Cleveland, Ohio, died there April 5. He was a pioneer in welding and hard facing of steel, and for 28 years an associate of the late CHARLES E. THOMPSON, founder of the company.

MEETINGS

AIR CONDITIONING MFRS. ASSOCIATION. Annual Meeting, May 16, Hot Springs, Va.

AMERICAN ELECTRO-PLATERS' SOCIETY. 24th Annual Convention, June 1–4, Hotel Carter, Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Summer Meeting, June 15–20, Dallas, Texas. C. E. Davies, Secretary, 29 West 39th St., New York, N. Y.

AMERICAN SUPPLY & MACHINERY MANUFACTURERS ASSOCIATION. Annual Meeting, May 11-13. Ambassador Hotel, Atlantic City, N. J. R. K. Hanson, 604 American Bank Bldg., Pittsburgh, Pa., Secretary.

REFRIGERATING MACHINERY ASSOCIATION. Convention, May 14–16, Hot Springs, Va. William B. Henderson, Secretary, 915 Southern Bldg., Washington, D. C.

SCIENTIFIC APPARATUS MAKERS OF AMERICA. Annual Meeting, June 1–3, Edgewater Beach Hotel, Chicago, Ill. J. M. Roberts, Secretary, 20 North Wacker Dr., Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. Summer Meeting, May 31–June 6, White Sulphur Springs, W. Va. John A. C. Warner, Secretary-General Manager, 29 West 39th Street, New York, N. Y.

SOUTHERN SUPPLY & MACHINERY DISTRIBUTORS ASSOCIATION. May 11-13, Ambassador Hotel, Atlantic City, N. J. Alvin M. Smith, Smith-Courtney Co., Richmond, Va., Secretary.

American Machinist
REFERENCE BOOK SHEET ©

Area and Weight Chart for Steel Stampings

Edward Heller

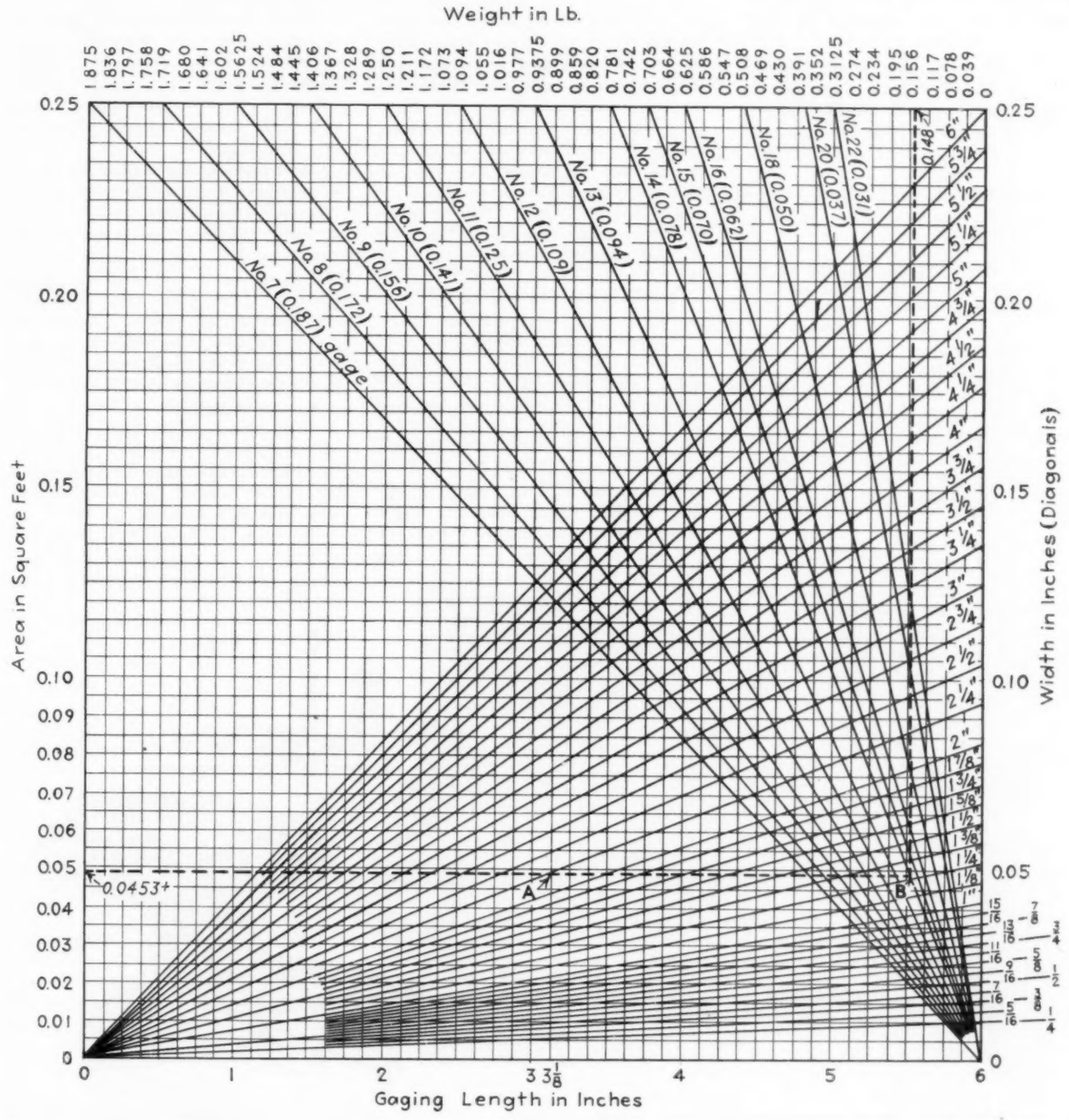
The area or weight, or both, of stock for steel stampings can be obtained from the chart when the width of the strip, the gaging length and the gage of the stock are known.

Example: Strip, 2.25 in. wide; gaging jump, 3.125 in. and gage of metal. No. 14, U. S. S.

Start with a gaging length of 3⅛ in. at the foot of the chart and trace upward to the intersection with the diagonal representing 2¼ in. width of strip. Trace to the left to get the area of 0.0543 sq.ft.

To get the weight, trace right from *A* to *B* on the intersection with the 14-gage line. Trace upward to the top of the chart where the weight is read as 0.148 lb.

In either case the figure represents the area or the weight of one stamping. By moving the decimal point the information is obtained for 10, 100, or 1,000 stampings.



IF THE WORKER ONLY KNEW—

Would he be afraid of mechanization?

"I SEE," said Sam, as he picked up Bill in his 1934 Cyclone, "that we got three new turret lathes yesterday. We keep buying machines and building machines—where's it all going to end?"

"So it's biting you now!" laughed Bill. "I expect it from those fellows who keep drawing charts without knowing the head from the tailstock, but not from a good mechanic like you."

"What's biting me, Bill?"

"Why the technocracy bug or whatever insect it is that makes a man believe that machines will ruin us all. We've had machines for a long time now and they haven't hurt us yet, have they?"

"We have unemployment, and you've got to admit that machines put men out of work. Take these new turret lathes for example. They're faster and more rigid than the old ones. They can easily turn out twice the work. And every year we're designing and building more efficient equipment ourselves."

"Sam, you've got your nose so close to the tool rest you can't take the long view of mechanization. Just suppose we scrapped all this machinery and passed a law not to build any more. How do you suppose you'd work and how would you live?"

"Nobody wants to do that, Bill, I'm not hankering to roll boulders up hill with someone cracking a whip over me. Handicraft is all right for artists but not for production. But we've got so much machinery now it seems we ought to keep it under control."

"If mechanization had a bad record, Sam, I'd agree; but just the opposite is true. I was reading the other day that between 1870 and 1930 the percentage of gainful workers rose from 32 to 40. Plenty of machinery was built during those years."

"It doesn't make sense, Bill. We make machines that take less manpower. That certainly throws men out of work, and yet you say that more men are working. What's the answer?"

"Simply that the use of machinery creates entire new industries that provide jobs for great numbers of workers, and that would never had been possible under the old methods. Take the automobile industry, for instance. Including bodies and parts, it accounts for close to half a million men. Electrical equipment, mechanical refrigerators, office machinery and tire manufacture have all formed the basis of great enterprises that have grown up in the last few years. They've made work and created wealth in the form of new products which the workers enjoy."

"But we've got to have the buying power to enjoy these products, Bill."

"True; and one of the best ways of increasing buying power is to lower costs. That means the use of better machinery. The lower costs get, the lower prices go, the more products are sold, the more have to be made, and the more people get jobs."

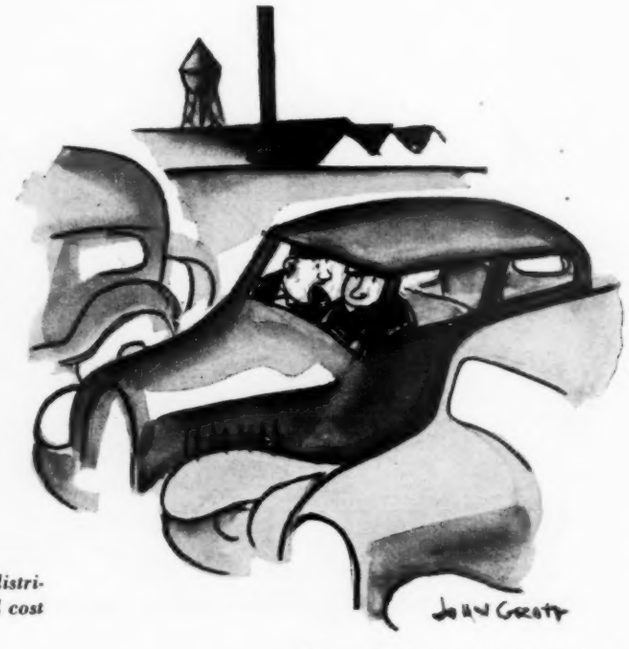
"That's fine, Bill, as long as everything is going right. We build bigger plants and better machines until all of a sudden we find we haven't enough money to buy their output. Then we come down with a crash as we did six years ago. It looks as though the more we mechanize the harder we fall when the boom ends. Something should be done to prevent all the hardship and misery these depressions cause."

"When you start on cause and effect of depressions, Sam, you're on a problem that the best minds haven't solved yet. But there's nothing to show that machines cause the trouble. In fact, many economists agree that the wide swings in business are financial rather than industrial. The speculator is the fellow who needs watching, not the engineer."

"Even so, Bill, haven't we gone far enough mechanically so we should put on some kind of control? Suppose we admit the engineer has outstripped the economist, can we ever hope to keep step with changes brought about by new inventions?"

"And who'll do the controlling, Sam? A political bureau or a group of industrialists with their own interests to protect? Who could have foreseen the development of electric light or electric power and controlled it intelligently? These things gave us greater comfort with less effort. There's no reason to think that we're at a stopping point now. Unhampered progress is the surest way to boost living standards for everyone."

"Why Sam," as the latter slid into an empty space in the factory parking lot, "this mechanization business that's got you so worried is the only reason why you and I rolled to work this morning in this little old Cyclone Six of yours. How you'd holler if we had to go back to the horse-and-buggy days!"



"Why, Sam, this mechanization business . . . is the only reason why you and I rolled to work this morning in this old Cyclone Six"

Reprints of this article, in pamphlet form, suitable for distribution in pay envelopes, can be secured at realtively small cost

POST-FLOOD OVERHAUL IMPROVES EQUIPMENT

Many machines are in better shape now than before the inundation, as the result of rapid work and fine cooperation of tool builders

FRED H. COLVIN
Editor

MOST manufacturing plants hit by the recent deluge, which made cataracts of streets in the lower levels of New England, upper New York and Pittsburgh areas, soon will be in a better condition than they have been in a long time.

Enforced reconditioning has made some machines equivalent to new, and practically all of the manufacturing equipment is being improved by the careful overhaul demanded by the catastrophe.

Floods are an old story in New England, and Johnstown and Pittsburgh have had their maelstroms, too. But the embankments and dikes which have usually sufficed to keep back the spring freshets in the Connecticut valley failed to withstand the flood which has cost millions of dollars. With amazing speed, however, production and shipments were resumed with the help of machine tool and equipment manufacturers who sent their experts immediately to the flooded areas to supervise the battle against rust and corrosion, waging their fight through mud, debris and filth.

Work Begun Speedily

In the Hartford district, the Cushman Chuck Company, the Colt Armory and the Terry Turbine Company were among the worst sufferers. Yet, before the water had receded from the ground floors, work of getting back into production was under way. As soon as the water broke into the shop, H. E. Sloan, president of the Cushman Chuck Company, telegraphed the builders of the machines in his plant to be ready to send 20 men to overhaul them as soon as they could get into the buildings. Some arrived upon the scene before the water had completely left the floor of the shop. Foremen and superintendents had rowed boats in through the windows to make preliminary inspections of the damage. Water had risen to the line shafts, and machines had been submerged for several days. Insulation on the windings of electrical machinery had been soaked, and gear boxes, bearings and other moving parts had been coated and caked with mud and fine silt.

All machinery was torn down, parts were boiled in soda, flushed with water and washed with kerosene; coils were slowly baked and then tested, and moving parts were polished and the machines were carefully reassembled.

Inventories of finished tools and parts had to be cleaned and refinished wherever the flood level had risen above the stock floors.

Forethought Prevented Delays

Forethought at the Cushman plant prevented a serious delay in getting back into production. Men in rowboats removed the fan motors of the heating system and electrical control apparatus, and sent them to a local manufacturer for reconditioning. As soon as the boilers could be fired, the fans and control equipment were back in service and helped to dry out the rest of the machinery quickly.

Where near enough, entire machines were shipped to the builders by truck for reconditioning. A builder who re-

Water reached to top of small sign at Cushman plant. Furniture, piled outside, was complete loss

Extent of dis-assembly required in reconditioning a lathe by Hendey Machine Company, Torrington, Conn. Components were further torn down to complete cleaning

conditioned a number of machines for his customers found the bases literally packed with dirt and silt. Some of the bases contained electrical control devices, which were also packed with dirt. So solid was this silt in some cases that it appeared to have been filled deliberately to see how much could be forced in. This added to the delay and expense of getting the machines at work again, because the dirt had to be removed carefully to prevent injury to the parts it covered.

Racks Made for Parts

One builder quickly fixed up racks for each machine to be overhauled. Each machine was placarded with a number corresponding to one on the rack. All tools and fixtures of the machine were put into the rack, carefully cleaned and inspected, and the equipment was reassembled from this rack. New parts, especially those which required a high degree of accuracy, were used and old parts were discarded.

Sewage, mixed with the flood waters, presented an acute problem. At the Hendey Machine Company parts were disinfected with a special solution compounded by the chemist. This cleaned off the dirt and grease, and prevented possible infection to workmen later on. Trisodium phosphate, chlorine compounds, caustic soda and kerosene were recommended by health authorities, who saw more danger to life in the aftermath of the floods than in the immediate emergency unless proper precautions were taken to prevent infection.

Health officers in all flood-area cities insisted on anti-typhoid innoculation for everyone who went back to work in offices and shops. This, together with the care in disinfecting machines and tools, prevented infection and diseases, the dread aftermath of most floods.

The Hendey company offered three propositions to manufacturers who had bought and were using their machines to bring them back to pre-flood condition, or even better! First, it offered to rebuild an old-type, belt-drive lathe into an up-to-date motor-driven machine. This type of lathe, with legs both above and below the pan, was converted into a pedestal machine. The work involved replaning and scraping the bed, refitting the carriage, substituting a new spindle and bearings, new lead screw and half-nuts, new tail stock spindle and other equipment requiring extreme accuracy. The second plan omitted the motor drive, but took care of renewing the working parts; and the third proposition included replaning and scraping the bed, and simply reconditioning the old parts. In every case equipment reconditioned was usually better than it had been before the flood, because the company tested the alignment and performance of the machine before it was returned to the user. A number of other builders handled their reconditioning similarly, and returned no machine that had not gone through the inspection required of new equipment.

However, some shops, under the pressure of production demands and for economy did not completely disassemble their machine, simply giving them a good kerosene bath and a thorough oiling job. This, in the opinion of many, was inviting trouble later on, and at best may prove to be chimerical economy.

Bearings presented a controversy. Two important machine tool builders insisted that no ball or roller bearing which had been submerged for any appreciable length of time should be put back into service on spindle or other work where real accuracy was required. They contended that they found incipient pitting at the point of contact between ball or roller and the race. Others cited cases where proper cleaning and oiling sufficed for subsequent use.

As interesting as were the problems found in reconditioning machines, one could not overlook the damage done to drawings, office furniture, correspondence and records, office machines, and to the buildings themselves. This wholesale destruction in some shops was an important factor in delays in filling orders, and presented added problems in getting plants back into production. Here, with thousands of square feet of paper soaked with disease-infested water, sanitation was a major consideration and everything was disinfected wherever possible. Oil barrels and tanks had been washed away and broken, leaving a greasy scum on everything the flood touched.

Tracings on good paper came through the ordeal better than those on cloth, but few, luckily, were actually ruined. Racks built of chicken wire, heated with oil stoves, quickly dried drawings, correspondence and records.

Office Furniture a Total Loss

Desks and other wooden office furniture were found to be a total loss after the flood receded. Drawers were so badly swollen that desks had to be smashed to open them. Steel furniture makers should find a ready market in replacing this furniture.

The quick and efficient service of machine tool builders in sending their best mechanics to the scenes of destruction, the many instances of where competitors offered their own plant facilities to get production under way in stricken factories, and cases reported where no charge was made for this emergency service, were silver linings in the rain clouds. Shopmen worked long and tirelessly to get the equipment into working shape under disagreeable, unhealthful and often dangerous conditions. Man has not learned to outwit the elements entirely, but ingenuity aided rapid recovery.

Ideas FROM PRACTICAL MEN

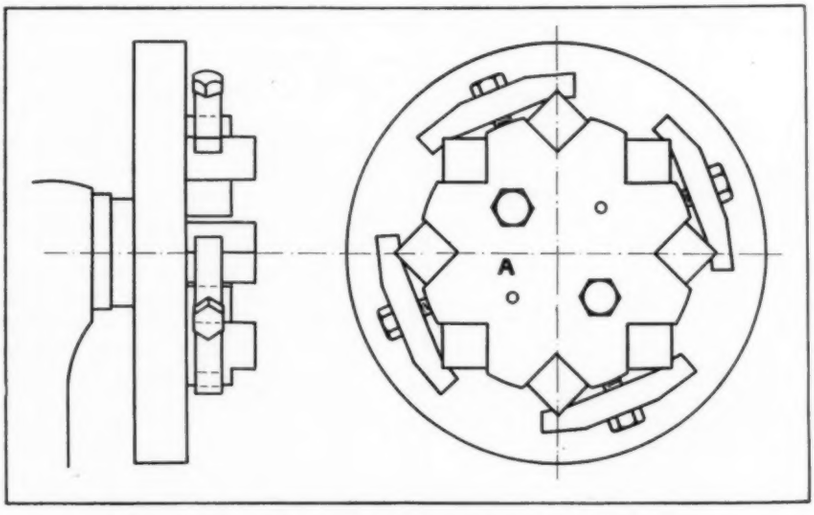
Lathe Fixture for Squaring Ends of Blocks

PETER L. BUDWITZ

In the production of tools and other work requiring steel blocks, a convenient method of procedure in making the blocks is to machine a bar of stock to the proper dimensions, cut off the pieces to the desired length and then square the ends.

The operation of squaring the ends of the blocks can be conveniently and economically performed by using a fixture similar to the one illustrated attached to the faceplate of the lathe. The main portion of the fixture *A* is a circular plate having a series of V-shaped nests cut in the periphery for receiving the blocks. Assuming that the nests in the plate have been machined squarely, it is evident that the ends of the blocks will be faced accurately, since they are located from two surfaces. The clamping method employed is clearly illustrated, one clamp holding two blocks simultaneously.

After the blocks have been faced on one end, the clamps are loosened and the blocks are turned to permit facing the opposite ends. After both ends have been faced, they will be square with the sides and the blocks will all be of the same length, since their inner ends were in contact with the faceplate while the opposite ends were being faced.



Since the inner ends of the blocks are in contact with the faceplate while the opposite ends are being faced, they will all be of the same length

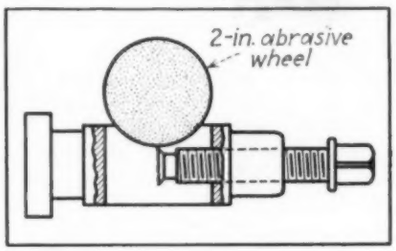
Removing a Mushroomed Screw From a Toolpost

E. L. SLEPPY

For removing a mushroomed screw from a toolpost, some time ago one of your correspondents advocated slitting the mushroomed end axially with a hacksaw, making two cuts crossing each other so that in removing the screw the mushroomed end would collapse enough in diameter to permit its passage through the tapped hole in the toolpost.

Since toolpost screws are hardened, this method would involve annealing the screw, otherwise it could not be cut with the hacksaw. Toolposts are generally casehardened, so that in annealing the screw the toolpost would also be annealed unless the screw could be annealed with a torch without annealing the toolpost.

A better method is to grind down the mushroomed end of the screw. Since the slots in toolposts are generally not less than $\frac{5}{8}$ in. wide and 2 in. long, there is plenty of room for a small abrasive wheel to reach the screw through the slot, as shown in the sketch. The toolpost can either be held in the hand, using a bench grinder, or clamped in the vise of a grinding machine. As the grinding proceeds, the screw can be slowly revolved in the toolpost until the mushroom has been reduced enough to pass through the tapped hole in the toolpost.



The mushroom on the end of a toolpost screw can easily be removed by grinding. There is plenty of room for a small abrasive wheel to reach the screw through the slot

Short Circuits in a Magnetic Bed Plate

K. B. HUMPHREY

A great deal of trouble was had from time to time because of short circuits in the holding coils of a magnetic bed plate, on a grinder. When the machine was operated regularly very little trouble was had but upon shutting down for a day or so the shorts recurred. The machine was used in a repair shop and not for production purposes.

The grinder was about 20 years old and the coils were set in lead in the conventional manner. There is a slight recess around the magnet poles where they were caulked originally, but they have never been caulked since. When the machine is in operation, the coils heat up slightly and tend to prevent water from entering, but when left to cool the water is sucked in.

The remedy employed was to wipe off the plate thoroughly after the run was over and to dry it up. After it had cooled the whole face was painted over with ordinary shellac. This prevented

the water from getting in and shorting the coils. It is an easy matter to scrape off the excess shellac with a small piece of sheet iron when the grinder is again about to be used. The shellac peels off in a layer and it is not necessary to do very much scraping.

The process has not affected the bed plate which still seems to be in good condition. If alcohol happens to be available, the face is sometimes given a thorough cleaning. When the alcohol is not employed, however, the recess around the magnet poles remains filled with shellac. Although the coils might have been caulked, the use of the shellac prevents all rusting of the bed plate between jobs.

Jig for Drilling and Reaming a Lever

PHIL. E. VERAA

In the illustration is shown a jig designed for drilling and reaming a hub on the end of the lever indicated by heavy dotted lines.

The strap *A* that holds the clamping screw is of the swinging type and is pivoted on the screw *B*. When pressure is applied to the work by the clamping screw, the end of the strap opposite the pivot is forced against the stop pin *C*, holding it securely. The lever rests on the three supports *D*, *F* and *H*, support *H* being a lug projecting from the head of the lower bushing. The hub to be drilled and reamed is centered by the V-block *I;* while the lever is aligned by one side at the end contacting the stop pin *K*.

With the work in place, the strap is brought into position and the clamping screw is brought against the lever, contacting it at an angle, forcing the hub into the V-block and holding the lever down on the supporting lugs.

When the jig is not in use, a wooden block is clamped in place of the lever, the clamping pressure reacting against the strap and preventing it from falling off.

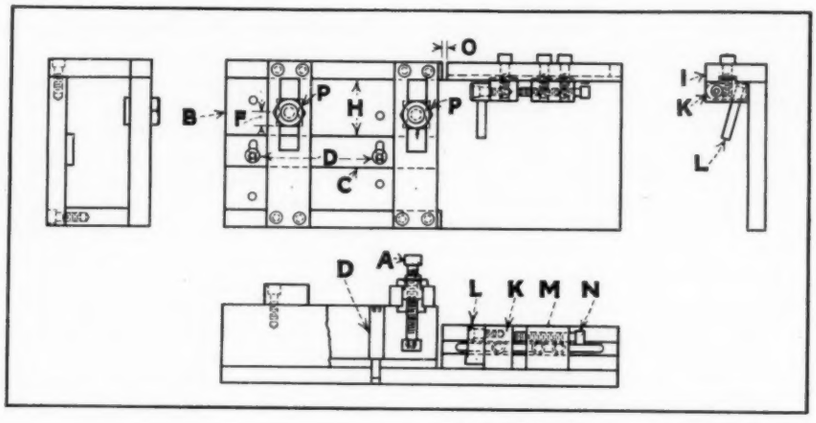
Cutting-Off Fixture for the Power Hacksaw

EDWARD HELLER

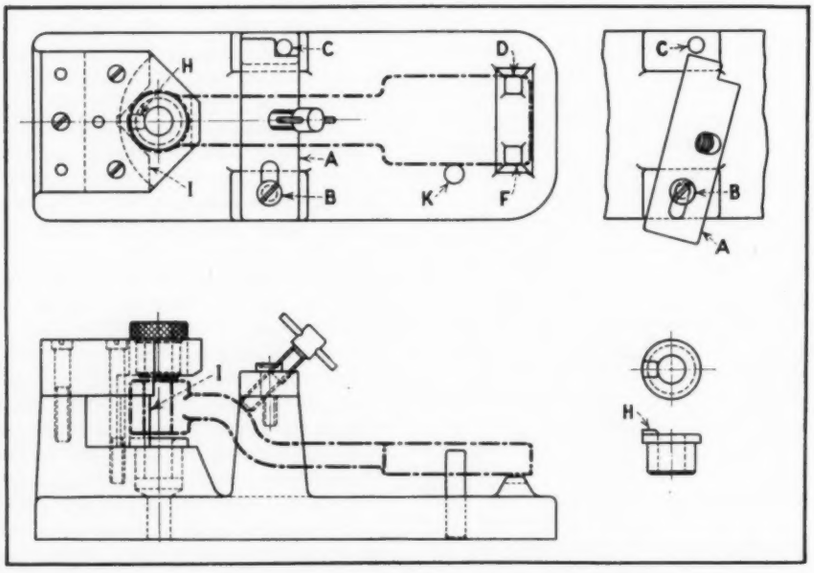
The fixture illustrated was designed for holding bars of various shapes to be cut into short lengths in the power hacksaw. It is shaped somewhat like a carpenter's miter box.

The clamping screws *A* are fitted with bronze shoes so they will not mar the work and are carried in rectangular nuts that can be adjusted in slots in the clamping bridges so as to clamp work of various widths. The bottom *B* is drilled and tapped with a series of holes for clamping the side strip *C* to provide a channel for the work to slide in. It is clamped by the screws *D*, the slots for which are slightly longer than spacing *F* between the tapped holes, thus providing an overlapping adjustment for the width of the channel *H*. At the right of the fixture is set up the back plate *I* for carrying the gaging device consisting of the block *K;* the swinging gage *L;* the back-up block *M;* and the adjusting screw *N* for fine adjustment.

In operation, the fixture is held in the vise of the machine, the saw blade clearing freely in the slot *O*. Strip *C* is brought to bear snugly against the work and screws *D* are tightened, leaving the work a close sliding fit between the back and the side strip. Nuts *P* are loosened and the nuts for the clamping screws are slid over to the required positions with reference to the work and are clamped in place. The gage is adjusted in correct position in relation to the right-hand side of the saw blade by means of a scale, or more accurately by a thickness block. The first piece cut off is checked for length and if not correct, adjustment is made to the gage by the screw *N*, which is of the hollow-head type and has 24 threads per in. One sixth of a turn, or the movement of one hexagon face, moves the gage 1/144 in. With a little practice the operator has learned to make adjustments of from 0.002 to 0.003 in. by sighting the hexagon faces in the hole in the head of the screw.



Held in the vise of a power hacksaw, this fixture will hold bars of intricate shape to be cut off in accurate lengths with a minimum of waste



The work is supported at three points and the hub is forced into a V-block by a single clamping screw held in a strap of the swinging type

The pieces are cut off in about one-third of the time formerly taken by a milling machine. Material is saved because the saw used in the milling machine was from $\frac{3}{32}$ to $\frac{1}{8}$ in. thick, while the hacksaw blade is but $\frac{1}{16}$ in. thick.

A few of the "bugs" that were encountered may be of interest. The two-part gage was originally made in one piece, and often the pieces cut off would get caught against the saw blade and break it. The addition of the swinging member *L* corrected the trouble, so that now when the work cut off sticks to the saw blade, it is carried along by the blade and the gage swings along with it part of the way. On narrow strips, where there is possibility of trouble from that source, the gage is swung up out of the way.

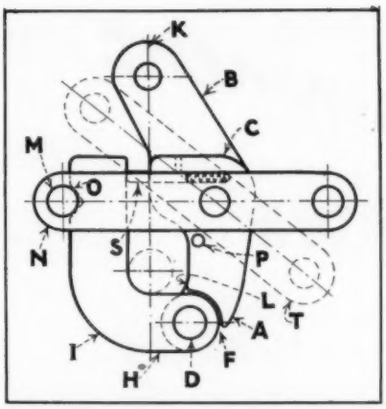
Another trouble was that the saw blades as bought would not cut square vertically. After experimenting it was found that by grinding away the rake of the teeth and grinding the blade tapering toward the back to give a clearance of from 0.001 to 0.002 in., the pieces were held to squareness and size for hundreds of cuts. When using a fixture of this kind, it is very important to set the downward stop correctly, otherwise the fixture will be damaged and possibly cut in two.

Safety Crane Hook

JOHN A. HONEGGER

Every now and then slings slip out of crane hooks, and to eliminate such a hazard the hook illustrated was developed. The forging *A* is made narrow at *B* but spreads out at *C* to the required width for the necessary strength, and is drilled and reamed for the pivot pin *D*. At *F* it is reduced to permit the forked end *H* of the pivoted link *I* to fit over it. Link *I* is pivoted behind the center line of suspension *K* and is shaped at *L* so that the sling holding the work will hang some distance from the pivot. The work thus suspended tends to keep the link in constant contact with the pin *M* in the pivoted straddle strap *N*, the pin engaging in the V-notch *O* causes a locking action.

Under no circumstances can the strap *N* drop so that the pin will be disengaged from the V-notch because it is prevented by contacting the pin *P*. By proportion of leverage, the front end of the strap is heavier than the rear end, so that it tends to remain in the locking position. The spring plunger *S* prevents vibration in the link by constantly pressing it against pin *M*, regardless of whether or not the sling intermittently yanks on the hook, which might occur if the sling vibrated or strummed when taut.



The hook is prevented from opening by strap N engaging a V-notch in the pivoted link

The hook is opened to admit or remove the sling by pulling down on the short end *T* of the strap.

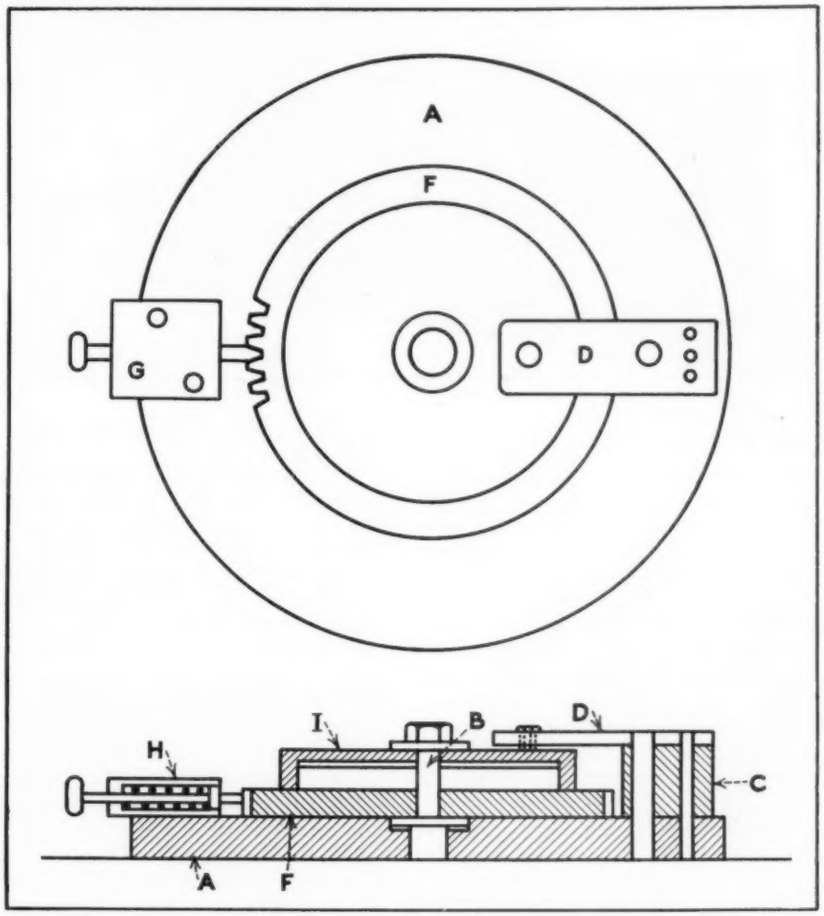
Inexpensive Master Jig

J. DAVIES
Oshawa, Ontario, Canada

We had to make some jigs for drilling six, eight and twelve bolt holes in pipe flanges. All the flanges were of the same bolt-circle diameter.

While the job did not call for great accuracy, it was desirable to have the bolt holes located within 0.005 in. for both center distance and radius. Since to lay out each jig and drill to lines and center-punch marks would be unsatisfactory, and to set up toolmakers' buttons for a number of jigs would be a very tedious process and would require the close attention of a skilled toolmaker, we decided to make the indexing master jig illustrated.

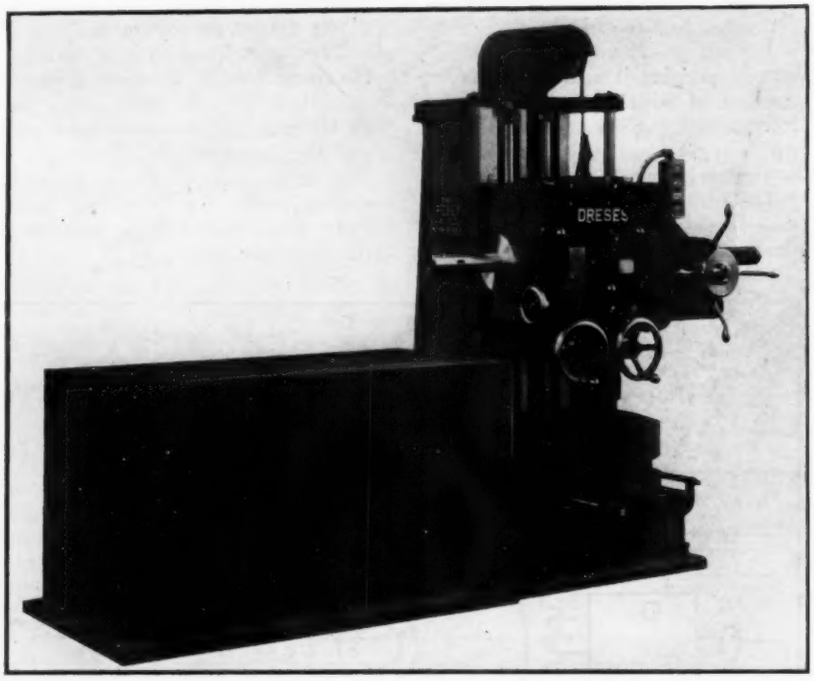
Essentially, the master jig consists of the round base *A;* the central stud *B;* the height block *C;* the bushing plate *D;* the gear *F*, used as an index plate; and the spring-actuated index pin *H*. The gear was borrowed from the change gears of a lathe and has 48 teeth, this number being divisible by six, eight and twelve.



A lot of toolmaker's time was saved by using a lathe change gear as the indexing means in a master drill jig

Shop Equipment NEWS

Dreses' Multi-Duty Horizontal Drilling and Milling Machines



Dreses Machine Tool Co., Cincinnati, Ohio, manufacturer of high-speed radial drilling machines, has added a stationary table-type horizontal drilling and milling machine to its line, which is distributed by Bryant Machinery & Engineering Co., 400 West Madison St., Chicago, Ill. The machine consists of a stationary table, the head of which is fully counterbalanced, and a column and column runway. It can be furnished in various table sizes, combined with various vertical travels of the spindle head, and various travels of the column on the runway.

As standard equipment, vernier scales reading to 0.001 in. are furnished, but a precision dial and rod measuring device can be furnished for the head and the column. A 3- to 5-hp. reversible motor and control, either a.c. or d.c., is used and is connected by V-belt to the multi-splined vertical driving shaft.

The spindle head is fully counterbalanced. The head contains all the driving mechanism for the spindle, the feed change unit for the drilling and boring feeds to the spindle, and milling feeds to the head and column. The feeds to the head and column are through extra large single pitch screws, with revolving nuts of phosphor bronze. The drilling and boring feeds to the spindle are through a multiple-disk friction clutch and worm and wheel, driving to a rack cut from the solid alloy steel spindle feeding quill. The entire twelve speed mechanism consists of sliding gears. They slide on alloy-steel splined shafts.

The feed mechanism is driven directly from the spindle, so the eight feeds can be applied to every spindle speed. A feed reverse is furnished for reversing all feeds. The entire control of the machine is on the head.

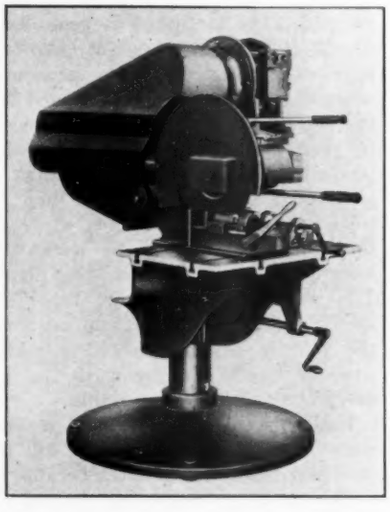
A machine of the following specifications weighs 14,000 pounds: spindle diameter, 3 or 3½ in.; continuous spindle feed, 18 in.; vertical travel of spindle head, 24 in.; horizontal travel of column, 24 in.; size of table, 30x60 in.; twelve spindle speeds from 15 to 500, or 30 to 1,000 r.p.m.; eight drilling, boring and milling feeds; range of drilling and boring feeds, 0.002 to 0.120 in.; range of milling feeds to head and column, 0.005 to 0.220 in. All feeds are per revolution of spindle.

Bethlehem Abrasive Cut-Off Machine

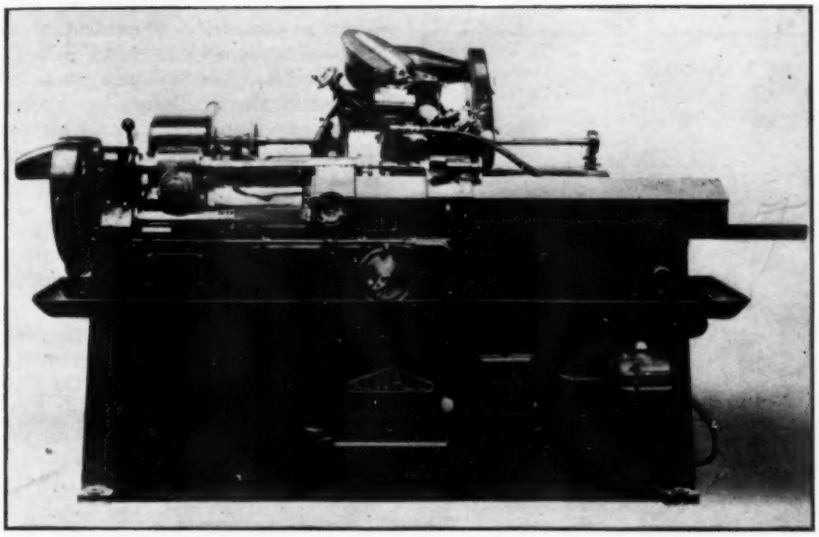
The Bethlehem Foundry & Machine Co., Bethlehem, Pa., has developed a universal abrasive cut-off machine, with both chop-cut and draw-cut stroke. Either or both may be used. Thus, structural angles or channels may be cut with one set-up in the vise, and small work, such as bars, strip, tube, pipe and cable, may be chopped off with as great speed as on machines not offering this dual capacity.

This machine will cut at any angle by swinging the head to position with relation to the table. Exaot position of the head is indicated by a graduated scale. To cut heavy work, such as castings, that cannot be supported on the table, the head may be swung into any desired position, away from the table, to handle this work.

The machine may be used to finish cut production pieces to size, eliminating additional operations and waste. With special trough for submersion of work, it is adaptable for cutting high speed and other alloy steels, glass, synthetic plastics and rubber.



Newall Automatic Universal Thread Grinder



The Reed-Prentice Corporation, Worcester, Mass., is manufacturing the Newall automatic universal thread grinder to grind taps, gages, dies, chasers, bolts and all precision threaded work. Pitch error is controllable within 0.0001 in.

The method employed is to take a series of light cuts at a high speed, a single-ribbed wheel being used for work such as thread gages. By this means strains which are always present in hardened work are released gently and consequent errors are corrected as they are released. Provision is made by means of a cam for grinding the relief on taps and for relieving straight and spiral flutes of any number.

One of the features of this machine is the patented diamond truing device with direct and positive control by an enlarged thread form operating on the pantograph principle. A projector is used to obtain an enlarged profile of the diamond from which the stylus is made.

The thread is obtained from a lead-screw and change gears, provision being made for right- and left-hand work. Division for multi-thread work or annular grooves is obtained by a ground worm actuating an accurately cut worm wheel.

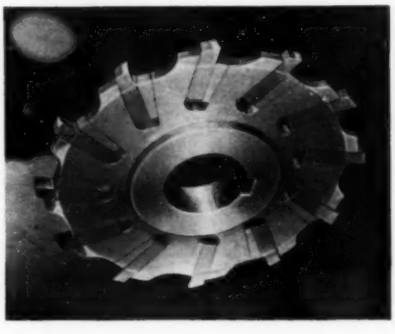
The wheelhead of this machine is driven by an incorporated a.c. motor with two speeds. Twelve work speeds are obtained from a compounded belt cone; and when required a backgear can be provided to double the number of speeds. The automatic reverse is at a fixed high-speed rate independent of the cutting speed. Traverse motion is obtained from hydraulically actuated clutches and the point of reverse is of extreme accuracy. The helix angle is obtained right or left hand by swivelling the wheelhead slide, motor and dresser bodily in a cradle.

Specifications: No. N.S. 4 machine: maximum grinding length, 10 in.; maximum length between centers, 10 in.; maximum diameter ground, 3 in.; right or left helix obtainable, 4 deg. For the No. N.S. 10 machine: maximum grinding length, 20 in.; maximum length between centers, 36 in.; maximum diameter ground, 4 in.; right or left helix obtainable, 15 deg.

Ingersoll Narrow "Tri-Lock" Cutter

Ingersoll Milling Machine Co., Rockford, Ill., has developed a "Tri-Lock" cutter blade for narrow keyway or slotting operations. Three sets of serrations are incorporated in the blade and wedge, each of which permits individual adjustment of a member. The cutter blade has horizontal and vertical serrations on its faces. The horizontal serrations permit adjustment in a diametrical direction, compensating for the major wear. The vertical serrations permit sidewise adjustment, enabling the cutter to be accurately held to size. The double set of vertical serrations in the wedge securely lock the blade.

Cutters as small as $\frac{7}{8}$ in. wide can be manufactured. The width or diameter is easily maintained by the triple-serrated blade lock.



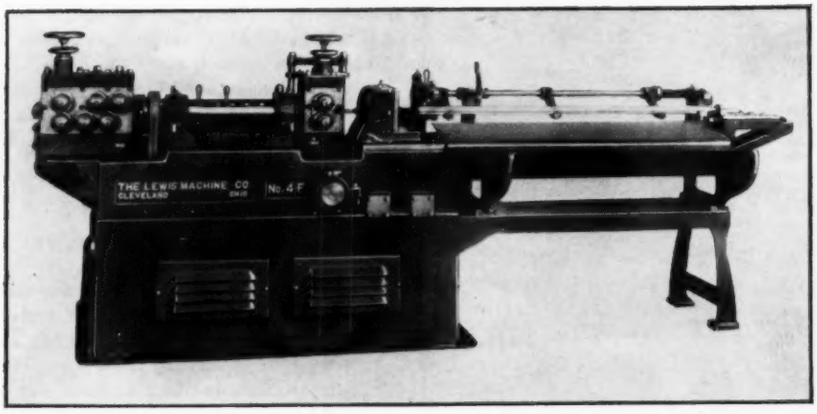
Michigan Gear Speeder

A gear speeder, designed to simulate actual operating conditions for testing gears for quietness, has been announced by Michigan Tool Co., 7171 East McNichols Rd., Detroit. It is designed to run pairs of production gears together forwards and reverse, under load, while being checked. The speeder has two spindles, each having its own drive and brake, all controlled through a single handwheel.

When the gears have been placed on the spindles, revolving the handle in one direction a quarter turn applies power to one spindle. Another quarter of a turn applies the brake to the opposite spindle. Returning the handwheel to "neutral," and continuing a quarter turn in the opposite direction applies the drive to the second spindle, while another quarter turn also applies the brake to spindle number one. Thus the condition of reversed loads, such as are obtained in automobile transmissions, can be simulated.

The machine takes gears up to 14 in. in length on the rear, and up to 17 in. in length on the front spindle, allowing for the largest gear-clusters. Center distances are adjustable from $2\frac{5}{8}$ to $5\frac{3}{4}$ in. maximum, permitting the testing of gears up to $8\frac{1}{2}$ in. in diameter.

Lewis "Travel-Cut" Wire Straightening and Cutting Machine



"Travel-Cut" is the trade name given to a flying-shear, automatic wire straightening and cutting machine developed by the Lewis Machine Co., 1592-1600 East 24th St., Cleveland, Ohio. This machine feeds the wire from the coil, straightens, gages to accurate length and cuts on the fly. This method assures a uniform-diameter rod throughout the entire length and produces a rod that is free of feed-roll marks. Although the machine is equipped with an instantaneous-acting, roll-type clutch, the cutting of accurate, uniform lengths does not depend upon accurate engagement of the clutch or brake adjustment.

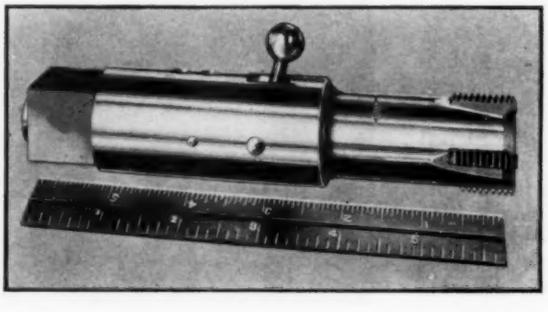
The cut-off die is fastened to the traveling cut-off head. This head has vertical ways to guide the cut-off knife-holder, and moves forward with the wire during the cutting operation. The cutting knife is operated by means of a quick-action cam on the flywheel shaft similar in design to that used on Lewis standard high-speed cutting machines. By adapting this quick-action cam to a traveling cut-off head, the wire is cut during the central portion of the forward travel of the head. Approximately 60 deg. forward motion of the head drive crank are available for gaging the length before the knife strikes the wire. This assures accurate lengths without critical adjustments.

The machine is equipped with a roll straightener to remove the coil bow and rough straighten the wire before it enters the rotary straightener arbor or flier. A standard five-die steel rotary straightener is used for the finish straightening operation.

Landis Collapsible Hand Sizing Tap

An improved collapsible hand sizing tap has been added to the line of machine taps manufactured by the Landis Machine Co., Waynesboro, Pa. This tap, designed primarily as a hand sizing tap to take the place of the solid adjustable tap ordinarily used, offers the advantage of instant withdrawal from the work without requiring to be backed out. It also eliminates the tearing of the threads frequently caused by backing out a solid tap, and undue wear of the chasers by having the radial clearance worn off in the backing-out operation. Tapping time is saved and production is increased.

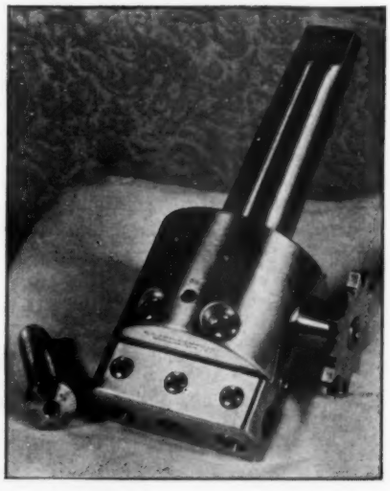
A small handle or trigger is located on the side of the tap body for unlatching the tap and collapsing the chasers by pressing back on the handle. The chasers are reset by pressing against a plunger extending slightly beyond the rear of the tap shank. The tap shank is provided with a square end to fit a tap wrench. Any length of shank or tap can be supplied. The tap is provided with a diametrical adjustment of approximately $\frac{1}{32}$ in. both over and under the nominal chaser size, a total of $\frac{1}{16}$ in. The adjusting screw is located in the front end of the tap and is of the ratchet type, making it self-locking to maintain size. A turn of one notch to the adjusting screw gives a diametrical movement of the chasers amounting to 0.001 in. The Landis collapsible hand tap can be furnished in all sizes from $1\frac{3}{8}$ to 12 in. inclusive. Tap sizes and ranges conform with the regular machine collapsible taps manufactured.



Craley Heavy-Duty Boring and Facing Head

A combination boring, turning and facing head with a range from 0 to 20 in. has been developed by the C. C. Craley Mfg. Co., P. O. Box 192, Shillington, Pa. Four $1\frac{1}{8}$-in. holes are provided for boring bars, three in the face and the fourth directly through the block at a right angle. The boring bars are held by three or more socket head screws; the dovetail tool block is 6 in. long, $2\frac{1}{2}$ in. wide and $\frac{3}{4}$ in. high and has a $2\frac{1}{2}$ in. travel, $1\frac{1}{4}$ in. right or left hand from center for hand or power feed.

The head is equipped with a star wheel feed screw to be used when doing such work as facing and undercutting. By the use of a special trip that is furnished as standard equipment, the star wheel may be adjusted



one or two points at each revolution of the spindle. The feed is instantly started or stopped by engaging or releasing a spring plunger. When the head is used for boring and turning the graduated dial screw replaces the star feed screw.

"Stanoil" Series of Six Lubricating Oils

The Standard Oil Co. of Indiana has announced a series of six oils which combine important characteristics for industrial lubrication. "Stanoil," in six grades, will replace many of the company's present brands because the series possesses qualities necessary to replace hundreds of brands of special oils now in use. The oils have unusually high stability, excellent demusibility, low carbon-forming tendencies, good color, good viscosity index and low pour test. Sales office, 910 South Michigan Ave., Chicago, Ill.

Hardinge "Cataract" Precision Ball Bearing Lathe

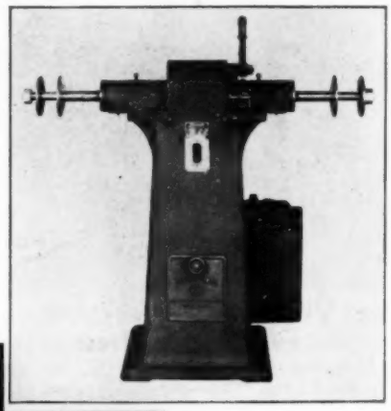
A precision lathe for production, toolroom and laboratories with a 36-in. bed has been announced by Hardinge Brothers, Inc., Elmira, N. Y. The inclosed headstock is fitted with preloaded ball bearings, to provide accuracy and high spindle speeds, and to obviate adjustments. The connected bearing, inclosed headstock has been designed to produce accurate work, to allow heavier cuts.

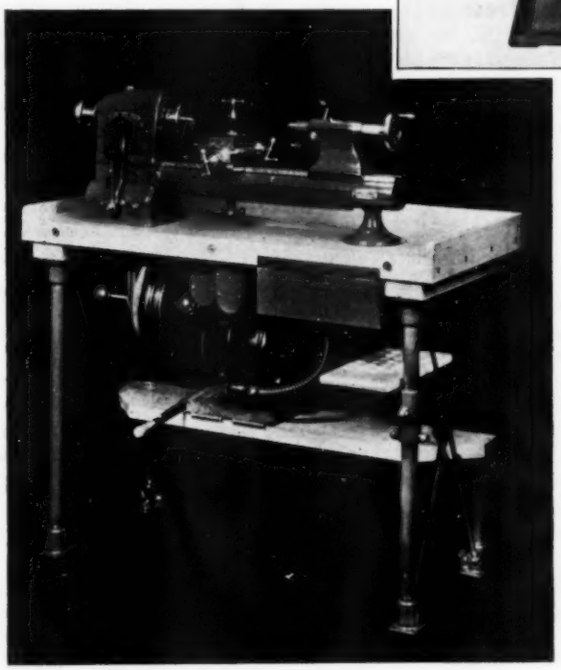
The spindle is hardened and ground, both internally and externally. The spindle is mounted in a rotating member to eliminate wear. Each bearing section is lubricated through cups at the rear of the headstock. The oil hole is filled with felt to filter the lubricant. A mechanical brake is mounted inside the inclosed headstock and is operated by the forward-stop-reverse control lever. Action of the brake is positive and rapid, but gradual. A wide range of speeds is obtained without using gears or clutches.

The bench lathe comes in 5 sizes ranging from ½ in. collet capacity to 1 in. Swings, 7 and 9 in.

"Standard" Selective-Speed Buffer and Polisher

Selective-speed buffing and polishing machines of 3, 5, 7½, 10, 15 and 20 hp. are now being built by the Standard Electrical Tool Co., 1940 West 8th St., Cincinnati, Ohio. It is possible to obtain any spindle speed required with these machines, and when they are equipped with a patented adjustable speed sheave, a spindle speed increase of 50 per cent may be obtained with an infinite number of steps. Power is transmitted to the buffing spindle by four V-cog belts. An elevating screw permits raising and lowering the 1,800 r.p.m. ball-bearing motor to put the required amount of tension on the belt. The entire spindle may be removed intact for renewing belts without disturbing the ball bearings.





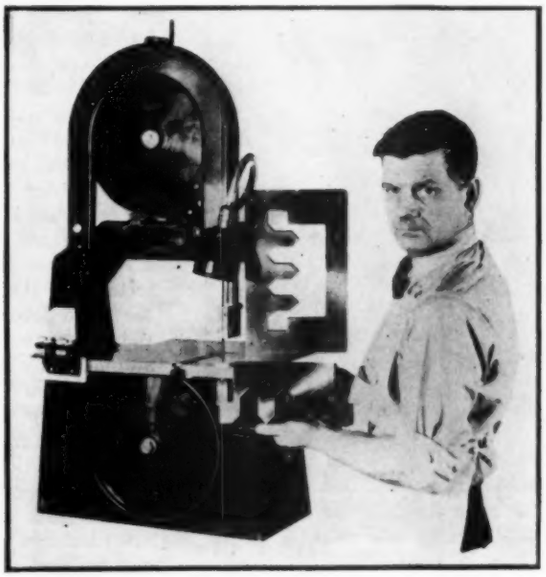
"Beltpaco Junior" Belting

A transmission belting for light work has been announced by the New York Belting & Packing Co., 1 Market St., Passaic, N. J. This belt, named "Beltpaco Junior," is designed for light or fractional-horsepower drives, transmission drives characterized by light tensions, small pulleys and small bearings, small machine or machine tool drives and auxiliary drives in machines. It is also adapted for use as shaping or forming belts in machines processing materials where its functions are like that of a special light conveyor.

Bench Model "Do All" Filing and Bandsaw Machine

A continuous-band filing, sawing and emery machine in a bench model has been developed by Continental Machine Specialties, Inc., 1301 Washington Ave., South, Minneapolis, Minn. The machine operates at 140 ft. per min., and its capacity is material up to 6 in. thick. Its throat is 12 in. It is powered with a built-in ⅓-hp. motor with an integral geared-head reduction unit.

The machine uses a saw blade only $\frac{3}{32}$ in. wide. Link file bands and emery cloth bands are carried in stock by the company. For brazing band saws for internal sawing, a jig and complete equipment comes with the machine.



Starrett High-Speed Molybdenum Hacksaw

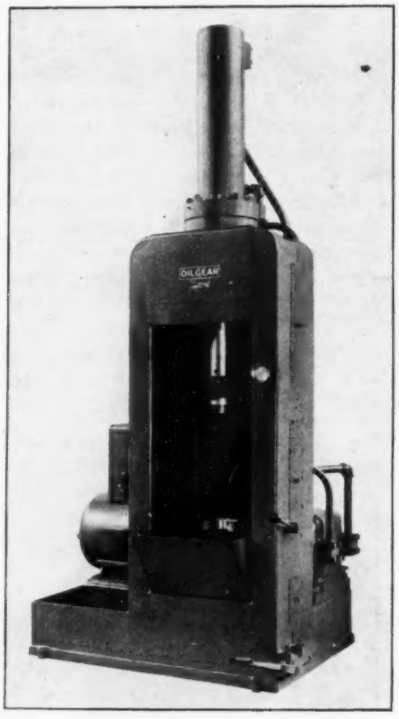
The "S-M" hacksaw blade, of hard, long-wearing molybdenum steel, has been added to the line of L. S. Starrett Co., Athol, Mass. It may be used for fast, economical cutting on nickel, monel metal or stainless steel alloys, high-speed, manganese or tool steel, phosphor bronze and similar hard alloys, and will cut solids, angles, channels, pipe and rails. Blades are made in 10 and 12 in. lengths, and in 14, 18, 24 and 32 teeth per in. sizes for hand frames. Power blade sizes are 12, 14, 17, 18, 21 and 24 in. long, have 4, 6, 10 and 14 teeth per in.

Noble & Westbrook No. 24 Tube Marker

Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn., has developed a power marking machine to meet the special marking requirements of manufacturers of thin-walled metal hollow parts. The carrying dial is constructed to hold any type of such work. The only operation required is to place the work on the pins which protrude from the revolving dial. Parts are carried by the revolving dial to the marking die, where they are marked, and then unloaded automatically. Distortion in marking is avoided by having the pins on the dial act as mandrels to support the parts while they are being marked.

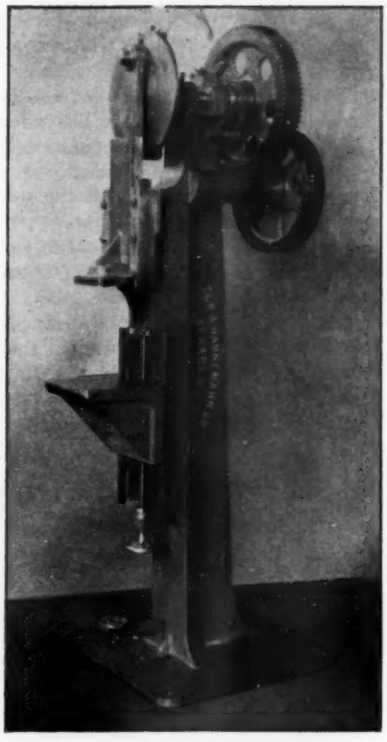
The revolving dial is driven by a worm and gear, which run continuously in a bath of oil. Trade marks or designs, names, letters or numbers can be clearly marked with these dies.

Noble & Westbrook No. 24 power marker set up for marking metal radio tubes



Oilgear Special 35-Ton Two-Column Press

A 35-ton, two-column press for broaching, assembling, straightening and general manufacturing purposes has been designed by the Oilgear Co., 1403 West Bruce St., Milwaukee, Wis. The press is shown set up for broaching a rear-axle housing tube with a view to eliminate stress concentration, due to tool marks and sharp corners. Each housing tube is placed in a locating and holding fixture on the base and the back wall of the press, and the $1\frac{1}{16}$ in. diameter broaching tool is inserted into the end of the tube. When the hand lever or pedal is depressed, the ram moves down and lubricant automatically flows on to the tool and work. When the end of the tube is broached the tool drops to the base, the ram returns automatically to the starting position and the flow of lubricant is stopped. The tube is then removed and another inserted. This press features welded-steel construction and inclosed control mechanism.



Zeh & Hahnemann No. 4-1 Power Punch Press

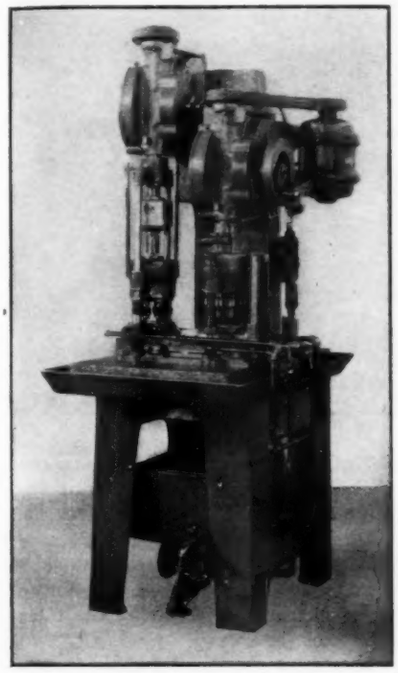
A long stroke punch press of the adjustable stroke type for comparatively light pressure has been developed by Zeh & Hahnemann Co., 182-200 Vanderpool St., Newark, N. J. The stroke is adjustable up to 10 in. The table, which is also adjustable for approximately 10 in., will, when adjusted down, permit a die space of 8 in. with the full stroke of 10 in. and stroke down. The distance from the center of the press to the edge of the frame is 5 in. The bottom of the slide can be made to suit the customer's requirements.

The press can be furnished either plain or geared. If geared the ratio is 1 to 6. Speed of the plain press is 100 r.p.m., and the motor is 1 hp.

"Solderux" Non-Corrosive Soldering Flux

A non-corrosive soldering flux for soft-soldered joints is being marketed by the Mann Instrument Corp., 10 Arrow St., Cambridge, Mass., under the name "Solderux." It is nearly as active at soldering temperatures as highly corrosive zinc chloride, while at ordinary temperatures it is quite inert and does not corrode.

Excellent joints on copper to copper, brass to brass, and iron to brass are easily made with no corrosion of joints.



Langelier Drilling and Tapping Machine

A machine built by Langelier Mfg. Co., Inc., Providence, R. I., for drilling and tapping is constructed with two standard No. 21 automatic drilling units mounted on a vertical column, each driven by individual motors. One is equipped with a six-spindle attachable multiple drillhead; and the other has a six-spindle attachable multiple tapping head with a reversing mechanism. The fixture is adjustable, so that work requiring four. five or six holes can be drilled and tapped. The driving and tapping spindles in the multiple heads, however, are located on fixed centers and the center distance between holes in various lengths or pieces cannot be varied. The machine is set-up for drilling and tapping door knob handles.

The work is loaded into a vertical magazine and fed progressively through the drilling and tapping stations. Lubricant is provided by a motor-driven pump which directs a stream of cutting fluid to each of the tools. The drilling unit controls the cycle of the machine which is equipped with a cam for indexing. After this head is started in motion it operates a trip dog on the tapping head which feeds the taps through the work.

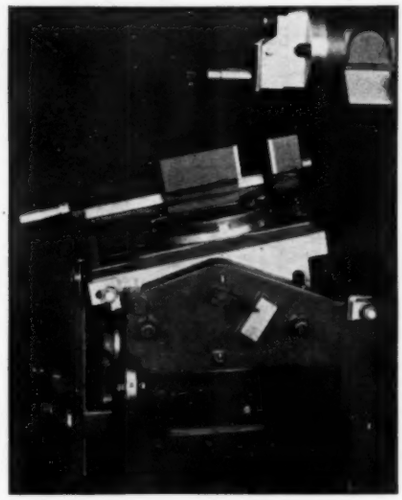
The drilling head is provided with spindles that are gear-driven and mounted on ball bearings. Adjustable collets are used to allow for grinding drills. The tapping head has compensating spindles.

Ohio Universal Shaper Table

The Ohio Machine Tool Co., Kenton, Ohio, has announced an improved design of universal table for its shapers made in sizes from 16 to 36 in. Ohio shapers are distributed nationally by the Bryant Machine & Engineering Co., 400 West Madison St., Chicago, Ill.

The universal table will revolve 360 deg. on a trunnion and the tilting top is adjustable 15 deg. either way from horizontal on an axis at right angles to the trunnion. The unit is further equipped with a solid top located 90 deg. from the tilting top.

The table is rotating by a self-locking worm and worm wheel, the move-



ment desired being read on a large graduated dial. A stop is furnished for the 90 deg. position, which brings the solid top under the ram. Solid top and tilting top have three T-slots.

Carboloy 6- and 10-In. Carbide Grinders

The Carboloy Co. Inc., 2985 E. Jefferson Ave., Detroit, Mich., is offering two pedestal grinders, 6 and 10 in. sizes, for grinding cemented-carbide tools. These machines are said to be suitable, not only for resharpening tools dulled in ordinary use, but also for the rapid reconditioning of carbide tools on which the tip has been accidently broken, the reshaping of carbide tools, and the rapid grinding of milled and brazed carbide tools.

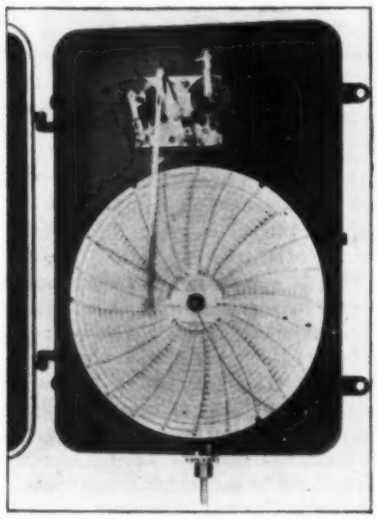
The 6-in. grinder is designed for the interchangeable use of silicon-carbide cup wheels for roughing and finishing, diamond wheels and lapping disks. It is intended for plants having carbide tools in the smaller size range, that is up to about $\frac{5}{8}$ in. square, and a relatively few larger sizes of tools. The 10 in. grinder is designed for both peripheral grinding on straight wheels of silicon carbide, and face grinding on silicon-carbide cup wheels.

These machines are built for Carboloy by the Ex-Cell-O Aircraft & Tool Corp., Detroit, Mich. The 6-in. machine was fully described (*AM*—Vol. 80, page 352) and also the 10-in. model, (*AM*—Vol. 80, page 318).

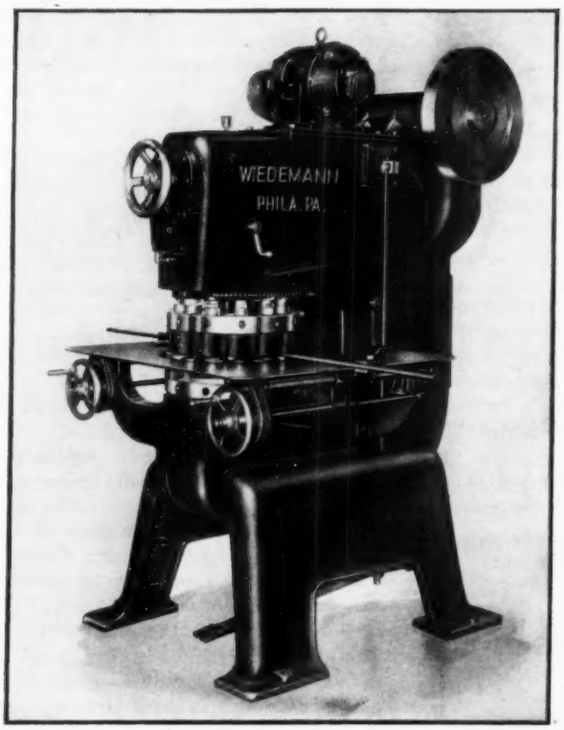
Bristol Small-Bulb Gas Thermometer

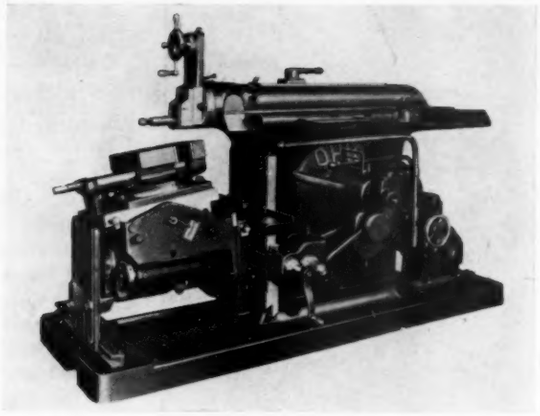
An accurate gas-filled recording thermometer, with a small temperature-sensitive bulb for long lengths of connecting tubing, has been developed by the Bristol Co., Waterbury, Conn. It is offered for measuring temperatures between —60 F. and 1,000 F., where tubing lengths as long as 100 ft. and more are required.

It is extremely accurate under all conditions of temperature both along the tubing and in the case, responds quickly to rapidly fluctuating temperatures at the bulb, and records on a uniformly graduated chart. The thermometer is fully compensated, and tempera-



ture changes in the case of the instrument and along the tubing are corrected for by a compensating device. This eliminates the necessity of long bulbs on thermometers having tubing lengths over 25 ft. It consists of a rectangular case in which there are mounted two Class III measuring elements, connected through a compensating mechanism. It is offered with one or two pens in the 12-inch chart size; and with one pen in the 8-inch chart size.





Left—Wiedemann turret punch equipped with twelve knockout punches. Upper right—Rearrangement of Ohio "Dreadnaught" shaper controls saves time in operation

Wiedemann Type R-5 Turret Punch With Special Gage

The Wiedemann Machine Co., 1815-31 Sedgley Ave., Philadelphia, Pa., has provided a Type R-5 heavy-duty, motor-driven turret punch with metal work table and graduated rear gage bar. This machine has been specially arranged to punch knockouts in electrical conduit boxes, and is equipped with twelve knockout dies. All of these dies are instantly available by revolving the turret to bring the required size into the front position.

The six single knockout dies are arranged in sequence from ½ in. diameter conduit to 2 in. diameter conduit inclusive, the other stations have concentric dies.

When punching ordinary sheet steel any thickness up to No. 11 gage can be used, the machine having a depth adjustment to the ram to insure punching clear through the sheet without breaking the slug out. The back gage bar has in-and-out movement by double screws with a full-length scale set in the right-hand edge of the table. Setting is accomplished by the handwheel in the front of the machine. The gage bar is 78 in. long and is graduated in 32nds for 24 in. at each end, and can be equipped with an adjustable end stop at one or both ends. The handwheel on the righthand screw is standard, whereas the left handwheel shown is furnished as an extra.

The steel plate table is approximately 39 in. wide by 23 in. deep and is supported by four cast-iron brackets bolted to machined pads on the base of the machine. These are also the bearings for the gage screws.

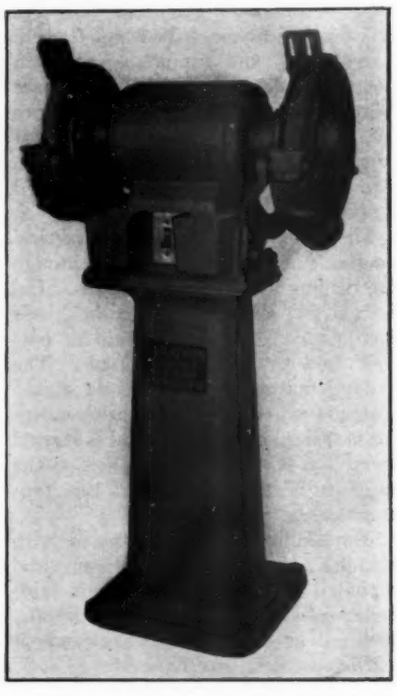
"Ohio" One Position Controlled Shaper

The Ohio Machine Tool Co., Kenton, Ohio, for which the Bryant Machinery & Engineering Co., 400 West Madison St., Chicago, Ill., is the exclusive distributor, has brought out a rearrangement of the controls on its "Dreadnaught" shaper to reduce the amount of time lost by the average operator running the shaper on miscellaneous jobs. The entire grouping of the feed control is located on the end of the rail, in connection with the power rapid traverse for the cross movement of the table and the vertical movement of the crossrail. A single lever stops, starts and reverses the feed. The large-diameter, feed-change dial is so arranged that the operator simply turns this dial to the amount of feed desired. A safety crank for hand movement, equipped with a dial graduated in thousandths, aids hand operation. Power rapid traverse control is by a pushbutton station marked "toward and away."

The control of the ram stroke is such that the operator may put his crank on the squared end and turn it until the length of stroke is read directly on a dial at this position. Removing the crank from the squared end automatically locks the stroke. Control for the clutch, brake and speed change have been grouped into a small circle, so it is never necessary for the operator to leave his regular position by the table to control the shaper.

Marathon Grinders and Buffers

The Marathon Electric Mfg. Co., Wausau, Wis., has added 1-hp. and ¾-hp. grinders and buffers to its line. These machines are available in single-phase, three-phase and d.c. models. The exceptionally heavy wheel guards meet all safety code requirements and dismount easily for wheel replacement. The toolrest makes it possible to use various wheel sizes and still set it for any desired grinding angle. Furnished with or without pedestals.



The Round Table

GOOD SAMARITAN

"It looks as though you'd gone into the second hand business, Al. What are all these old pumps of ours doing here?"

"They're being overhauled, Ed. I guess reconditioned is the proper name nowadays."

"How come, Al? And why all at once?"

"When I read about the floods lately I looked over our customers list and found we had a number in the districts that were hard hit. So I sent them all a special delivery letter offering to put their equipment in good order at cost."

"Philanthropic again, eh? How can we earn dividends without profits? Or are you kidding them along to get the work in the shop?"

"Not a bit, Ed. When I say 'at cost' that's what I mean. It seems the only decent thing to do. I'm sure it will help build good will, and that's an important item in any business."

"But just why should we pass up a profit because they've been unlucky enough to live where the rivers go on a rampage occasionally?"

"Trying to be hard boiled, Ed? You're the fellow who spent an hour last Sunday pulling a dumb driver out of the ditch. And you wouldn't even take the dollar he offered you—probably all the poor guy had. It wasn't your fault he was in the ditch, so why didn't you take a mortgage on his car or something?"

"That's different, Al. This is business where we're supposed to make money."

"It may not be quite a parallel case, I'll admit, Ed, but it's the same principle. These customers will have plenty of expense getting on their feet again. If they go broke we lose customers. If we help them by passing up a profit now, we'll probably get their future business."

"That's gambling on futures, Al. You can't pay dividends that way—and I want dividends. How do we know they'll ever want any more pumps?"

"We don't, of course, Ed, but there are good chances that they will. I only mentioned that possibility to soothe your ruffled feelings about dividends. I'd do it if I knew we'd never get any more orders; it's the only decent thing to do. Call it contributions to the flood sufferers if you'd rather, but we'll do it anyhow."

"It's not the same, Al. Flood sufferers are people who lose their homes."

"Or their jobs, Ed. And if these firms can't continue business it means people out of work."

Is Al too generous in offering to repair flood-soaked equipment of his own manufacture at cost?

DISCUSSION

Home Talent

Usually, heat-treating occurs at the stage when either a considerable part or all of the machine work has been completed, and spoiling the work at that time would be quite a loss. If the amount of Al's work should warrant the purchase of adequate equipment and the breaking in of a man to specialize in heat-treating, then it would be quite advisable for him to have his heat-treating done in his own shop; otherwise he should send the work to a specialist.

—Robert Knotek,
Toolroom Foreman,
Fisher Body Corporation,
Cleveland Division.

It is not wise to rely on an outside firm for heat-treating when there is sufficient work to provide full-time employment for one or more men. A disadvantage of having the work done outside and one that is often overlooked is that of transportation between the two shops. The cost of this depends on the distance and the amount of work to be moved. This cost, the time lost and the possibility of damage during transit may considerably outweigh any possible advantages. In particular, when heat-treating must be done with a minimum of delay, sending work out may be of great disadvantage.

—W. E. Warner,
Orpington, Kent, England.

Gaging Gages

By all means inspect gages at definite intervals. These intervals will depend upon the type of work to which the gages are put. For example, we had a case where severe wear was encountered. Girls inspecting wire drills finish ground on a centerless

grinder were at one time using maximum and minimum snap gages that became practically useless in an hour. This was due to wear of the anvils caused by the fine emery particles carried along with the grinding solution. Until "Old Man" Halliwell conceived a high-precision, quick-reading fluid gage, we required a gage inspector from the machine shop to reset the snap gages at least once an hour.

It is the bunk to send things to an outside testing laboratory for high-priced testing, except, of course, to the Bureau of Standards. We have had "experts" costing from $20 to $50 a day from testing laboratories to inspect certain customers' purchases. The quality and lack of speed of their work would result in their being fired promptly if they had been on our payroll.

A shop having any amount of precision work should buy testing instruments for inspecting its own gages and have a man who is capable of doing very accurate checking. This man should cooperate with the shop superintendent in determining just how often the various precision gages should be brought in for inspection. The only patrons of outside testing laboratories would probably be the little fellows who are not sure of enough business to warrant buying their own inspection instruments. —E. E. Gagnon.

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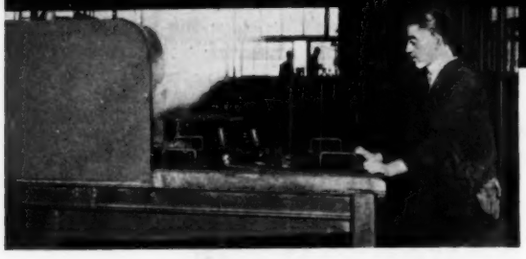

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Praise in Public

Al is right in being considerate of his men's feelings either in front of the other men or in private. If a man is so thick-skinned that he has to be bawled out in the presence of the other workers to make him sit up and take notice it is better to let him go.

It is very poor policy to hand out either bouquets or brickbats to a man in the company of others unless you are giving all of them bouquets or brickbats. If you have to point out a man's shortcomings to him, do it in private and he will at least respect both you and your position the more.

A good foreman always wants and tries to keep his men in as good a humor as is possible, as he knows that a man is at his best when he has an untroubled mind and is satisfied with his job, and that these conditions mean better work and more production.

—H. L. Derby,
Caromount Mills, Incorporated.

Undoubtedly Al is right in being considerate of his men's feelings. Most men will do better work if they are commended at judicious intervals than when they are being constantly criticised, and as a rule commendation does most good when it is given under circumstances where the group will know that merit has been recognized.

Criticism of course should be given in private if possible—no one likes to have his shortcomings pointed out before a crowd; it hurts his feelings, and it may do more harm than good. Of course, it must be realized that there are a few men who get swelled heads when you praise them. The leader must know which men profit from approval and which do not.

It is generally admitted that most of us appreciate the assurance and the confidence which comes from knowing that we stand well in the group to which we belong; but it is true that many executives don't realize this fact. They seem to fear that a relaxing of effort will be the result of praise, whereas there is no doubt that the opposite is usually the case.

—Nils H. Lou.

Open House

In a small shop it is not necessary to have a skilled employee in charge of the toolcrib, but it is obviously advantageous to have someone to issue tools and to see that they are returned to their appointed places.

Cutters can be ground by a skilled employee who is normally engaged in other work, as is Al's toolmaker. This man could also make periodical inspection of gages and other tools.

In one small works known to the present writer, employing from 30 to 40 men, the tool stores, material stores and spare parts stores are all looked after by one unskilled employee. This man looks after incoming goods, packs outgoing goods and finds time to paint the firm's products. The idea of having one man to do several odd jobs of this sort is to be recommended for the small shop, and if carried out properly the actual cost of his attendance in the toolcrib is quite low.

—Robert Hutcheson,
Kenton, Middlesex, England.

Concrete Floors

The objection to concrete floors depends upon the work each man has to do. A man whose duties require him to walk around most of the time probably does not complain about the hardness of the floor, as he may moderate his steps so as to lessen the strain on his feet. Nor does he have any reason to complain about the coldness, as he is able to keep his feet warm by the exercise due to his movement.

With the man at the machine the problem is different. I think his real objections are both the coolness and the hardness of concrete floors. The hardness because it puts extra strain on both his feet and his legs.

But there is another objection to concrete floors—dust. This can be eliminated by treating the floor with cellulose or other pore-sealing media.

—A. E. Fristedt.
Stockholm-Angby, Sweden.

Another Shift

Everyone with any executive authority has at some time or other felt the urge to rearrange the shop. Apart from the motives of reduced cost and handling convenience, there is the human element—the desire for change. Al's outlined plan suggests that he is endeavoring to please too many people. Some bench hands have told him that they want the light at their right and others have told him they want it at their left, picturing themselves as working alongside the windows and not at the inner end of the bench with other men obstructing the light.

I have known several machinists who preferred the lathes at right angles to the northern windows. When the lathes were at the south side of the room, these same men desired the lathes to be placed so that their backs would be to the windows to avoid the excessive glare of the summer sun.

The problem of making a wholly satisfactory layout of machines and benches has so many angles that it will be found impossible to fulfill all desired conditions or to all the machine and bench hands. Economic requirements and convenience will in many cases have to give way to physical and temperamental conditions. If the latter are ignored, the former will eventually suffer to such an extent that economic gains will be wiped out.

—Roy Vernon Wade,
Glasgow, Scotland.

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REDUCING INDUSTRIAL POWER COSTS—*By David Moffatt Myers, consulting engineer. 378 pages, 6x9 in. 34 tables and 43 illustrations. Published by the McGraw-Hill Book Co., Inc., 330 West 42nd St., New York, N. Y. Price $4.*

Power, heat and light cost the manufacturing industries of this country a sum aproximately equal to their combined corporate earnings. It follows that reduction of the cost of these requisites will effect an increase in earnings. The means of such improvement are highly technical, and in as simple language as possible the author gives a short intensive course on industrial steam and power engineering from the economic viewpoint.

He makes the point that frequently large savings can be made without large outlay. Where equipment must be bought he analyzes the various engineering and economic factors involved, in a way which will be illuminating to the non-technical executive and to the engineer familiar with power problems.

In getting down to cases, the author gives a list of 100 possibilities for power plant improvement and says this list could be multiplied many times. Even so the business man can readily appreciate the wisdom of some of these operation and equipment changes before he gets very deep into the subject.

Few power plant engineers are able to pick up information in scores of places as the author has done, through much and varied consulting experience. Therefore, the ideas per page and chapter occur with interesting frequency. The book covers such subjects as higher steam pressures, superheat, byproduct power, combustion, purchased and generated power, price of fuels and many other subjects.

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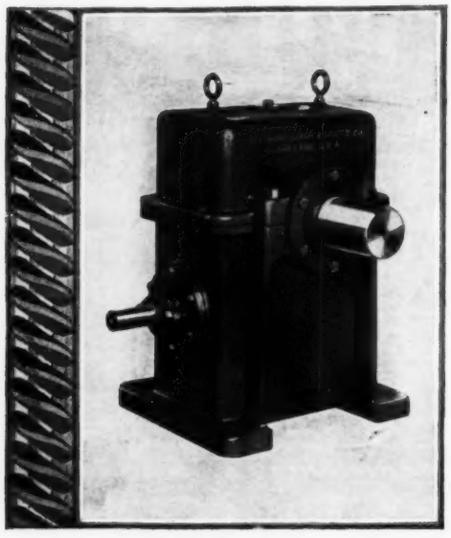

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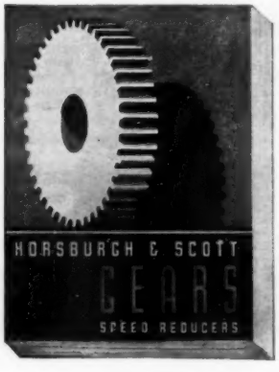

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TRADE PUBLICATIONS

ARC WELDING. "Electric Welding Machines and Welding Tips" is the title of a 64-p. reference book published by Charles Eisler, Eisler Engineering Co., 750 South 13th St., Newark, N. J. It has more than 1,000 illustrations and diagrams, and shows hundreds of special welding problems in various industries from all parts of the world. It is available from the company to users and prospective users of electric welding.

HACKSAW BLADES. L. S. Starrett Co., Athol, Mass., has issued a bulletin on its new line of "S-M" molybdenum steel hacksaw blades, for both hand and power work.

MATERIALS HANDLING. "The Efficient, Economical Method of Handling Materials" is the title of a 24-p. bulletin published by the Electric Storage Battery Co., Allegheny Ave. and 19th St., Philadelphia, Pa. It is fully illustrated and shows a wide range of uses of electric industrial trucks and tractors.

PROFILE PROJECTORS. Pamphlet No. 7229, containing 28 pages, gives an illustrated description of the E. Leitz, Inc., 60 East 10th St., New York, N. Y., large profile or contour projector.